RESEARCHES

IN

MEDICINE

AND

MEDICAL JURISPRUDENCE.

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TO

THEODRIC ROMEYN BECK, M. D.

PROFESSOR OF THE INSTITUTES OF MEDICINE, AND LECTURER ON MEDICAL JURISPRUDENCE IN THE COLLEGE OF PHYSICIANS AND SURGEONS OF THE WESTERN DISTRICT OF THE STATE OF NEW-YORK, etc. etc.

THIS VOLUME

IS MOST AFFECTIONATELY INSCRIBED,

BY HIS BROTHER,

THE AUTHOR.

NOTICE.

All the papers contained in the present volume, have already appeared in print. The flattering notices which have been taken of most of them, both abroad and at home, have induced me to believe, that the republication of them, in their present shape, might not prove unacceptable. It is, perhaps, unnecessary to state, that the treatise on Infanticide constitutes the portion which I contributed to the work on Medical Jurisprudence, published by my brother, Dr. T. R. Beck, and myself. In preparing it for the last edition of that work, it was subjected to a thorough revision, greatly extended, and, as I trust, somewhat improved. In its present form, I hope it may not be unworthy of the favor with which it has heretofore been received.

New-York, December, 1835.

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ON INFANTICIDE IN ITS RELATIONS TO MEDICAL JURISPRUDENCE AND MEDICAL POLICE.

PART I.

Of the history of infanticide as it has prevailed in different nations, ancient and modern.

It is a fact no less melancholy than astonishing, that a practice so unnatural as that of infanticide should ever have prevailed to any extent. Its existence might have been supposed possible in those unhappy regions of our earth, where untutored passion and brutal sense reign triumphant over reason and morality; but that the fairest portions of society, where genius, science, and refinement had taken up their abode, should have been disgraced by a crime so disgusting, is one of those anomalies in the history of human feeling and conduct, which irresistibly prove how perfectly arbitrary and undefined are the laws of justice and humanity, when unguided by the principles of true religion. The fact, however, is not more astonishing than true. A slight review of its history will show us that this practice prevailed in almost all the ancient nations, and that it is not even yet blotted from the list of human crimes.

The laws of Moses are silent on the subject of infanticide;* and from this circumstance we should be led to conclude that the crime was unknown among the Jews at that period of their history, and therefore that any positive prohibition of it was considered unnecessary. The penal code of the Jews is so very minute on the subject of murder in general—considers it so atrocious a crime, and denounces such terrible punishments against the perpetrators of it, that it is wholly incredible that the murder of infants would have been countenanced by their illustrious legislator. This conclusion is further confirmed by the considerations, that barrenness was esteemed one of the greatest misfortunes which could befall a Jewish woman, and that the Jews were all desirous of a progeny, because each cherished the hope that the Messiah might be numbered among his descendants. These facts would seem to prove that every inducement was held out for the preservation of children, and none to countenance their destruction.† At a subsequent period, when they became contaminated by their intercourse with the Canaanites, we find the Jews imitating‡ the example of their king Manasseh, who sacrificed his son to the idol Molech.§ These horrid sacrifices were suppressed by king Josiah, who commanded, "that no man might make his son or his daughter to pass through the fire to Molech."‖ And Tacitus, in describing the manners of the Jews of his day, says that they were not allowed to put their children to death.¶

The nations surrounding the Jews appear to have been addicted to the sacrifice of children. Of these, the *Canaanites* are described as "sacrificing their sons and their daughters unto devils, and shedding innocent blood, even the blood of their sons and their daughters, whom they sacrificed unto the idols of Canaan."**

* Commentaries on the Laws of Moses, by J. D. Michaelis, F.R.S. Translated from the German, by Alexander Smith, D.D. vol. 4.

† "Abortion and infanticide were not specially forbidden, but unknown among the Jews. Josephus, appealing in honest pride to the practice of his countrymen, reproaches other nations with these cruelties." (Milman's History of the Jews, vol. 1, p. 107. Harper's edition.)

‡ Jeremiah, vii. 31; and xix. 5.

§ 2 Chronicles, xxxiii. 6. 2 Kings, xxi. 6.

‖ 2 Kings, xxiii. 10.

¶ Hist. Lib. v. Cap. 5.

** Psalm cvi. 37, 38.

Among the *Egyptians*, infants were treated with more humanity; yet instances are not wanting of the greatest cruelty towards them. A memorable one is found in the commission of Pharoah to the midwives, to murder all the male offspring of the Jews. Their own children, however, were treated with greater tenderness; and they are, accordingly, on this account, mentioned with honour by some of the writers of other countries. Strabo, in particular, speaks of them as an honorable exception to those nations who exercised the right of life and death over their infants.*

Among the *ancient Persians*, it was a common custom to bury children alive. Herodotus tells us of Amestris, the wife of Xerxes, who, at an advanced age, ordered fourteen Persian infants, of illustrious birth, to be interred alive, in honour of one of the deities of the country.†

In most of the *Grecian states*, infanticide was not merely permitted, but actually enforced by law. The Spartan lawgiver expressly ordained, that every child that was born should be examined by the ancient men of the tribe; and that, if found weak or deformed, it should be thrown into a deep cavern at the foot of Mount Taygetus, called *Apothetæ*, "concluding that its life could be of no advantage either to itself or to the public, since nature had not given it at first any strength or goodness of constitution."‡ This practice was not, however, upheld merely by the sanction of law; it was defended by the ablest men of Greece. Aristotle, in his work on government, enjoins the exposure of children that are naturally feeble and deformed, in order to prevent an excess of population. He adds, "if this idea be repugnant to the character of the nation, fix at least the number of children in each family; and if the parents transgress the law, let it be ordained, that the mother shall destroy the fruit of her body before it shall have received the principles of life and sensation."§ The mild Plato also justifies this practice. In his

* A History of Inventions and discoveries, by John Beckmann, translated by W. Johnston, vol. 4, p. 435.

† Beloe's Herodotus, vol. 4, p. 37.

‡ Plutarch's Lives, translated by Langhorne, vol. 1, p. 142.

§ Travels of Anacharsis, vol. 5, p. 270.

Republic, he directs that "children born with any deformity, shall be removed and concealed in some obscure retreat."*

Of the existence of infanticide at *Athens*, we have the testimony of the comic poets, who, in describing the manners of that city, frequently allude to the exposure of children.†

Thebes, however, exhibited a noble contrast to the rest of Greece. By one of her laws, it was expressly forbidden to imitate the other Grecian cities, who exposed their children at their birth.‡

Of all the nations of antiquity, the *Romans* were the most unrelenting in their treatment of infants. The Roman father was vested with an absolute authority over the lives and fortunes of his children;§ and we have abundance of testimony to show that the right was commonly exercised. This barbarous prerogative was coeval with the existence of Rome, and continued to triumph over justice and humanity during the lapse of many ages, until Christianity wrested it from her. Romulus authorised the destruction of all children that were deformed. He, however, required the parents to exhibit them to their five nearest neighbours, and to obtain their consent to their death.‖ The law of the Twelve Tables, enacted in the 301st year of Rome, sanctioned the same barbarous practice.¶ After this, even the slight restrictions which Romulus had imposed upon parents, appear to have been removed, and an unqualified jurisdiction surrendered to the father over the lives of his children, even after they had arrived to years of maturity. Sallust mentions an instance of the latter. "Fuere tamen extra conjurationem complures, qui ad Catalinam initio profecti sunt: in his A. Fulvius, senatoris filius; quem retractum ex itinere, *parens jussit necari.*"—Sallust, Cat. xxxix.

* Travels of Anacharsis, vol. 4, p. 342.

† Vide Quarterly Review, vol. 2, p. 389, for quotations from Terence and Plautus.

‡ Travels of Anacharsis, vol. 3, p. 277.

§ The right of parents over their children is thus stated in the Institutes of Justinian, Lib. 1, Tit. ix. p. 22, Cooper's edition. Jus autem potestatis, quod in liberos habemus, proprium est civium Romanorum; nulli enim alii sunt homines, qui talem in liberos habeant potestatem, qualem nos habemus.

‖ Montesquieu's Spirit of Laws, vol. 1, p. 104. London.

¶ Cooper's Justinian, p. 659.

The procuring of *abortion*, which can be considered no less than murder, was also notoriously prevalent among the Romans. Juvenal thus speaks of that nefarious practice:

> Hæ tamen et partus subeunt discrimen et omnes
> Nutricis tolerant, fortuna urgente, labores
> Sed jacet aurato vix ulla puerpera lecto;
> Tantum artes hujus, tantum medicamina possunt.*
>
> *Juv. Sat.* vi. 476.

Minucius Felix thus describes the barbarity of the Romans in this respect: "I see you exposing your infants to wild beasts and birds, or strangling them after the most miserable manner. Nay, some of you will not give them the liberty to be born, but by cruel potions procure abortion, and smother the hopeful beginning of what would come to be a man, in his mother's womb."† Pliny, the Elder, himself defends the right of parents to destroy their children, upon the ground of its being necessary to preserve the increase of population within proper bounds.

Such was the practice of ancient Rome from her first origin down to the time of Constantine the Great. During the days of her greatest political grandeur, it was carried to the highest excess; and whilst she was boasting of her refinement, and casting the opprobrious epithet of barbarian on all around her, she was guilty of the basest profligacy, and the most hardened cruelty. Christianity first opposed a barrier to the desolations of this crime; her mild and humane spirit could not but discountenance it; and accordingly it animated all who were arrayed under her peaceful banners, to exert their energies in arresting its progress. The christian writers of that day are full on this point. Tertulian, in his Apology, expresses himself with heroic boldness on the subject: "How many of you," (addressing himself to the Roman people, and

* "Yet these, though poor, the pain of childbed bear,
And without nurses their own infants rear.
You seldom hear of the rich mantle spread
For the babe, born in the great lady's bed.
Such is the power of herbs; such arts they use
To make them barren, or their fruit to lose."

† Octav. Minucii Felicis, ch. xxx.

to the governors of cities and provinces,) "might I deservedly charge with infant murder; and not only so, but among the different kinds of death, for choosing some of the cruelest for their own children, such as drowning or starving with cold or hunger, or exposing to the mercy of dogs; dying by the sword being too sweet a death for children, and such as a man would choose to fall by, sooner than by any other ways of violence. But christians now are so far from homicide, that with them it is utterly unlawful to make away a child in the womb, when nature is in deliberation about the man; for to kill a child before it is born, is to commit murder by way of advance; and there is no difference, whether you destroy a child in its formation, or after it is formed and delivered; for we christians look upon him as a man who is one in embryo; for he is a being like the fruit in blossom, and in a little time would have been a perfect man, had nature met with no disturbance."* In A. D. 315, Constantine the Great enacted a law, providing for the maintenance and education of those children whose parents were too poor to do the same.† He also ordered a severe punishment to be inflicted on a cruel father. This was the first time that the authority of the government had interposed to arrest this crime; and it is not to be supposed, that a custom which had become so familiar to all the habits and feelings of the Roman people would be immediately suppressed; and accordingly we find that it still continued to prevail, though in a less degree, until the end of the 4th century, when it was finally exterminated by the emperors Valentinian, Valens, and Gratian.‡

* Reeves' Apologies, &c. vol. 2, p. 190.

† Ant. Univ. Hist. vol. 15, p. 576.

‡ Mr. Gibbon thus expresses himself in relation to this practice among the Romans: "But the exposition of children was the prevailing and stubborn vice of antiquity; it was sometimes practised, often permitted, almost always practised with impunity, by the nations who never entertained the Roman ideas of parental power; and the dramatic poets, who appeal to the human heart, represent with indifference a popular custom which was palliated by the motives of economy and compassion. If the father could subdue his own feelings, he might escape, though not the censure, at least the chastisement of the laws. And the Roman Empire was stained with the blood of infants, till such murders were included by Valentinian and his colleagues, in the letter and spirit of the Cornelian law." (The History of the Decline and Fall of the Roman Empire—by Edward Gibbon, Esq.—vol. 3, p. 186, Lond. Ed.)

The *Phenicians* and *Carthagenians* were in the habit of sacrificing infants to their gods. The latter had a law by which four children of noble birth were regularly immolated upon the altars of Saturn.* History records a melancholy instance of the superstition and cruelty of these deluded people. It is related, that they attributed their defeat by Agathocles, king of Sicily, to an omission of these sacrifices, and in order to atone for their past neglect, they offered up, at one time, two hundred of the sons of their nobility.

Silius Italicus notices this custom:

> "Mos fuit in populis, quos condidit Advena Dido,
> Poscere cæde deos veniam, ac flagrantibus aris
> (Infandum dictu) parvos imponere natos." Lib. 4.

The *ancient Germans*, although in the habit of sacrificing prisoners taken in battle, do not appear to have been addicted to the crime of infanticide. Tacitus, in describing their manners, mentions a contrary practice as one of the peculiarities distinguishing their character: "Numerum liberorum finire, aut quenquam ex agnatis necare, flagitium habetur."†

Among the *Visigoths*, the murder of infants was a common crime. Chindaswinthus, one of their kings, in his laws, describes the procuring of abortion, as well as the murder of children after they are born, as practices that were prevalent in the provinces, and denounced severe penalties on the perpetrators of those crimes.‡

But *infanticide* was not confined to the ancients. It has descended to modern nations, and at the present day disgraces Eastern and Southern Asia by its enormities.

The *Chinese* are notorious for their cold indifference in the exposure and murder of their children. According to Mr. Barrow, the number of children exposed in Pekin alone amounts to 9000 annually. No law exists to prevent it; on the contrary, it appears rather to be encouraged, inasmuch as persons are employed by the police of the city to go through the different streets every morning in carts, to pick up all the chil-

* Ant. Univ. Hist. vol. 17, p. 257.

† De Morib. Germ. xix.

‡ On the history of the effects of religion upon mankind. By Rev. Edward Ryan. p. 110.

dren that may have been thrown out during the night. "No inquiries are made; but the bodies are carried to a common pit without the walls of the city, into which all, whether dead or living, are promiscuously thrown."* The practice is not confined to the capital; it prevails also in other parts of the country. It is calculated that the number of infants destroyed in Pekin, is about equal to that of all the rest of the empire.† Almost all those that are exposed are females. The causes assigned for its prevalence, are extreme poverty, arising from an overgrowth of population; frequent and dreadful famines, springing from the same cause; the natural coldness of affection in the Chinese, together with the sanction of custom, and the want of any law forbidding it. Mr. Ellis, who visited China with the British embassy in 1816, expresses some doubts with regard to the frequency of infanticide in China.‡ Whether the estimate of Barrow be too large or not, it is impossible to say. The general prevalence of the crime, however, is unquestionable; and recent travellers speak of it as still existing in all its horrid deformity. "At the beach of Amoy," says Mr. Gutzlaff, "we were shocked at the spectacle of a pretty new-born babe, which shortly before had been killed. We asked some of the bystanders what this meant; they answered with indifference, 'It is only a girl.'" This same traveller says, "It is a general custom among them to drown a large proportion of the new-born female children. This unnatural crime is so common among them, that it is perpetrated without any feeling, and even in a laughing mood; and to ask a man of any distinction whether he has daughters, is a mark of great rudeness. Neither the government, nor the moral sayings of their sages, have put a stop to this nefarious custom."§ The same writer, in another work, makes the following statement: "Infanticide, of which the husbands are

* Travels in China, &c. by John Barrow, esq., p. 113. (American edition.)

† Ibid. p. 114. Also De Pauw's Philosophical Dissertation on the Egyptians and Chinese. (Quarterly Review, vol. 2, p. 255.)

‡ Journal of the Proceedings of the late Embassy to China, &c. By Henry Ellis, third commissioner of the embassy. Vol. 2, p. 209. London, 1817.

§ Journal of Three Voyages along the Coast of China, in 1831, 1832 and 1833; with Notices of Siam, Corea, and the Loo-Choo Islands. By Rev. Charles Gutzlaff. Page 142. (American edition.)

the only perpetrators, is not uncommon; but female children only are murdered, and then immediately after their birth. This horrible crime meets with no punishment from the laws of the country; a father being the sovereign lord of his children, he may extinguish life whenever he perceives or pretends that a prolongation of it would only aggravate the sufferings of his offspring."* Another late traveller says, "In some provinces, not one out of three is suffered to live; and in others, as the writer has been informed by the Chinese from those places, the difference between the male and the female population is as ten to one."†

Among the *Hindoos*, infanticide presents itself in a form still more horrible. It is incorporated into their system of religion, and its atrocities are beyond description. It has existed among them for at least 2000 years, for Greek and Roman historians notice it, and refer to some of the very places where it is now known to exist.‡ The number of infantile murders in the provinces of Cutch and Guzerat alone, amounted, in 1807, according to the lowest calculation, to 3000 annually; according to another computation, 30,000.§ Females are almost the only victims. In defence of the practice, they urge the difficulty of rearing female children, the expense attending their education, and the small probability of their ever being married.‖ Within a few years, through the benevolent exertions of some of the subjects of Great Britain, it was supposed that infanticide had been completely abolished in many of the pro-

* A Sketch of Chinese History, Ancient and Modern, &c. By Rev. Charles Gutzlaff. Vol. 1, p 46. (American edition,) 1834.

† See a Journal of a Residence in China, &c. from 1829 to 1833. By Rev. David Abeel. pp 128, 158. New-York, 1834.

‡ Christian Researches in Asia. By the Rev. Claudius Buchanan, D.D. English edition, p. 49. — View of the History, Literature, Religion, &c. of the Hindoos. By William Ward, D.D. p. 393. American edition.—Also Moor's Hindu Infanticide, &c. Review of the same in London Quarterly Review, vol. 6, p. 210.

§ Buchanan's Researches in Asia, p. 49. Also Moor's Hindu Infanticide, p. 63.

‖ The modes of perpetrating the deed are various. Dr. Buchanan states that two are principally prevalent. As soon as it is known to be a female, a piece of opium is put into its mouth; or the umbilical cord is drawn over its face, which, by preventing respiration, destroys it. (Researches in Asia, p. 47. Moor's Hindu Infanticide, p. 55, 56.)—Another mode still more common, however, is to drown the child, as soon as it is born and ascertained to be a female, in a large vessel of milk placed in the room for that purpose. (Moor's Hindu Infanticide, p. 27. Heber's Travels, vol. 2, p. 70. American edition.)

vinces. Mr. Duncan, governor of Bombay, Marquis Wellesley, and Col. Walker, were the persons who took the lead in this affair, and whose energy and perseverance it was hoped and asserted had been crowned with complete success.* It is melancholy to be obliged to state, on the authority of a recent traveller, that the benevolent labours of these gentlemen were attended with only temporary success. Bishop Heber, in his travels in 1824 and 5, says, "Through the influence of Major Walker, it is certain that many children were spared; and previous to his departure from Guzerat, he received the most affecting compliment which a good man could receive, in being welcomed at the gate of the palace, on some public occasion, by a procession of girls of high rank, who owed their lives to him, and who came to kiss his clothes, and throw wreaths of flowers over him as their deliverer and second father. Since that time, however, things have gone on very much in the old train, and the answer made by the chiefs to any remonstrances of the British officers, is, 'Pay our daughters' marriage portion, and they shall live.' Yet these very men, rather than strike a cow, would submit to the cruelest martyrdom."†

Previously to the conversion of *Otaheite* to christianity, infanticide was so common that it threatened the complete depopulation of the island. It was found as a common practice, when the island was visited by Capt. Cook;‡ and just anterior to the introduction of christianity, according to the most accurate estimates, at least two-thirds of the children born were destroyed.§ It appears to have been confined to no rank or class of the community, but to have been universally prevalent. Mr. Ellis states, that he did "not recollect having met with a female in the island, during the whole period of his residence there, who had been a mother while idolatry pre-

* For a full account of these measures, see "Hindu Infanticide: An account of the measures adopted for suppressing the practice of the systematic murder, by their parents, of female infants; with incidental remarks on other customs peculiar to the natives of India." Edited, with notes and illustrations, by Edward Moor, F. R. S. London, 1811. 4to. In this volume, the report of Lieut. Col. Walker is particularly interesting.

† Narrative of a Journey in the Upper Provinces of India, &c. By the Right Rev. Reginald Heber, D.D. Vol. 2, p. 70. American edition.

‡ Cook's Voyages, vol. 2, p. 72, 85.

§ Turnbull's Voyage round the World in 1800-2-3-4. Polynesian Researches, by William Ellis, vol. 1, p. 198. American edition.

vailed, who had not imbrued her hands in the blood of her offspring."* The effect which this practice had in diminishing the number of inhabitants, was astonishing, and affords a strong fact in refutation of the doctrine which has been maintained by some, that the practice of destroying children has a direct tendency to augment population. In 1776, when Capt. Cook visited the island, he found it to contain upwards of 200,000 souls. In less than thirty years after, this terrestrial paradise, blessed with a genial climate and a luxuriant soil, was reduced to 5000 inhabitants.† Turnbull relates, that "the missionaries made two tours whilst he was in the island, and in each of which they numbered the people; according to the first calculation they were 7000, but in the last they very little exceeded 5000."‡ It is not to be supposed that this enormous diminution of population is to be attributed solely to this cause; other causes have doubtless co-operated, particularly certain diseases which prevail to a great extent, such as fevers, dysentery, phthisis pulmonalis, and scrofula.§ All travellers, however, who have visited the island, concur in the opinion, that the effects of infanticide have been infinitely more injurious to the population than all the other causes combined. It is consoling to reflect, that through the exertions of christian philanthropy, this horrid and barbarous custom has been entirely abolished.

In most of the *South Sea Islands*, the same practice has prevailed to an enormous extent, and has only been checked by the benign influence of christianity.‖

Among the *Sandwich Islanders*, however, there is reason to believe that it still exists in much of its native deformity. Sometimes they strangle their children, but more frequently bury them alive. What is peculiar in the barbarity of these people, is, that even should a child be spared for a few weeks or months, they have no hesitation in destroying it at any

* Polynesian Researches, vol. 1, p. 198.

† Turnbull, vol. 3, p. 77.

‡ Ibid. vol. 3, p. 77–8.

§ Edinburgh Medical and Surgical Journal, vol. 2, p. 284–90.

‖ For interesting notices on this subject, see Journal of Voyages and Travels by the Rev. Daniel Tyerman and George Bennet, esquire, vol. 1, p. 53; vol. 2, p. 67, 162. (American edition.)—Also Polynesian Researches, by W. Ellis, vol. 2, p. 29, &c.

subsequent period. Among the *Otaheiteans*, on the contrary, if the child survived only a few hours, it was generally saved. At least two-thirds of the children born, are here also sacrificed.* The principal cause assigned for the prevalence of this crime among these people, is their excessive indolence, and their dread of the trouble to be encountered in rearing their children. Among the *Society Islands*, the rules of the Areoi Institution requiring the death of all the children of its members, operated as another powerful cause.

Among the natives of the interior of *Ceylon*, the same inhuman practice prevails. When a child is born, an astrologer is consulted to foretel its future fortune; if it should be unhappy, it is carried to the jungle and abandoned, where it is destroyed by cold, or devoured by wild beasts. Generally speaking, all the male children, as well as the first female child, are exempted from this unhappy lot. So common is the destruction of all the rest of the female offspring, that "it has been observed, in the districts where this practice prevails, that more than one female child is rarely to be found in a family."† The effect of this practice upon the relative proportion of male and female population, is very striking. According to the calculation of Mr. Marshall, the females are to the males as 84 to 100; while in England they are as 98.8 to 100.‡ The only extenuation offered for this crime, is the extreme poverty of the people. Bishop Heber, in speaking of the prevalence of infanticide in Ceylon, states that in the last general census in 1821, the number of males exceeded by 20,000 that of females; in one district there were, to every hundred men, but fifty-five women; and in those parts where the numbers were equal, the population was almost exclusively mussulman.§ The difficulty of marrying their daughters, in a country where to live single is disgraceful, is one of the

* Polynesian Researches, vol. 4, p. 240. Stewart's Journal of a Residence in the Sandwich Islands, p. 185, 251.

† Notes on the Medical Topography of the Interior of Ceylon. By Henry Marshall, Surgeon to the Forces. pp. 22, 33, 37. London, 1821.

‡ Ibid. p. 33.

§ Narrative of a Journey through the Upper Provinces of India, with Notes upon Ceylon, &c. &c. By the late Right Rev. Reginald Heber. Vol. 2, p. 197. American edition.

principal causes, according to Heber, of this unnatural custom.*

The natives of *New-South-Wales* resort to violent and unnatural compression of the body of the mother, in order to procure abortion. This process is called by them *Mee-bra*, and is resorted to for the purpose of avoiding the trouble of carrying about the child when young, a duty which devolves entirely on the female. As may naturally be supposed, the mother not unfrequently falls a victim in this horrid process. Another practice still more shocking prevails, of burying a child with its mother, if she happens to die.† This practice is justified by them, upon the ground of the difficulty, and even impossibility of nursing and rearing a child under these circumstances.

Among the *New-Zealanders*, infanticide is asserted to be a common occurrence. When a girl is born, it is said the mother not unfrequently destroys it, "by pressing her finger upon the soft part between the joinings of the skull."‡

Among the *Hottentots*, infanticide appears to be a common crime. Sparman states "that the Hottentots use, in case of the mother's death, to bury alive children at the breast;"§ and Barrow describes a race of them called *Bojesmans*, who destroy their offspring on various occasions: as "when they are in want of food; when the father of a child has forsaken its mother; or when obliged to fly from the boors and others: in which case they will strangle them, smother them, cast them away in the desert, or bury them alive."‖

The *Mahometans* do not appear to attach any criminality to child-murder;¶ on the contrary, the very sources of honour

* "An astrologer is consulted on the birth of a female child; and if he pronounces her to have been born under evil auspices, she is exposed alive in the woods, to be destroyed by beasts of prey or by ants—generally, I was happy to hear, without the consent of the mother." Ibid. vol. 2, p. 197.

† Account of the English Colony of New-South-Wales. By Lieut. Col. Collins, of the Royal Marines. p. 124–5. Edinburgh Review, vol. 2, p. 34.

‡ The Library of Entertaining Knowledge, *New-Zealanders*, p. 387. Cruise's Journal, p. 290.

§ A Voyage to the Cape of Good Hope, &c. from the year 1772 to 1776, by Andrew Sparman, M. D. vol. 1, p. 257.

‖ An Account of a Journey in Africa, made in the years 1801 and 1802, to the residence of the Booshuana Nation, &c. by John Barrow, Esq. p. 378–91.

¶ It is proper to state, however, that the Koran forbids it; and in the oath which Mahomet required of the women who joined his party, called the "women's oath,"

and authority among them are polluted by it. Even the palace of the Sultan is constantly stained by the blood of infants. Thornton states, that the offspring of the younger princes of the royal family, who are kept in honorable confinement in the palace, are destroyed as soon as they are born.* And Blacquiere accounts for the smallness of the number of children belonging to the Bashaw of Tripoli, from the fact of his encouraging his wives to evade their accouchements.† A recent traveller says, that the Turkish women after getting two or three children, or as many as suits their fancy to have, are addicted to procuring miscarriages, at which they or their accouchesses (Jewesses) are exceedingly expert, not producing constitutional injury.‡

Dr. Bryce, in speaking of the present state of medicine at Constantinople, says: "Midwifery is almost exclusively practised by Jewish and Turkish women; and it is worthy of remark, that the obstetric art forms a very small portion of their adroitness or employment. All pretend to possess, and some have become famous and wealthy by their pretensions, certain means, not only to obviate sterility, but also to procure abortion by administration of drugs—a practice, avowedly tolerated, and frequently resorted to, by Turkish females, both from their dislike to frequent pregnancy, and from command of their lords, when their harem threatens to become too numerous.§

In *modern Egypt*, nothing is more common than the procuring of abortion. A class of females, well known for their skill, are employed to aid those who consult them in cases of this kind. This practice, which is very ancient, surprises nobody, and a woman aborts with astonishing indifference. In the towns and villages, there are individuals who are specially employed in this barbarous business. At Cairo, there are

the prohibition of infanticide was distinctly mentioned. (Buck's Theological Dictionary, Art. *Mahomet.*)

* The present state of Turkey, &c. by T. Thornton, Esq. vol. 1, p. 120.

† Letters from the Mediterranean, by E. Blacquiere, Esq. vol. 1, p. 90.

‡ Records of Travels in Turkey, Greece, &c. in the years 1829, 1830 and 1831, by Adolphus Slade, Esq. vol. 2, p. 162. American edition.

§ Sketch of the State and Practice of Medicine at Constantinople, by C. Bryce, M. D. (Edin. Med. and Surg. Journal, vol. 35, p. 8, 9.)

Arabian physicians, who for a great length of time, have followed this infamous trade. Infanticide is rarely made a subject of criminal investigation. When a married woman destroys her new born infant, in order to bring her to punishment, two eye witnesses are necessary. If she is convicted, she has to pay a large sum of money as a fine to her husband, or if she is unable to do this, he has it in his power to imprison her. If there are nothing but suspicions and she persists in denying the crime, she is only obliged to take a certain oath, to free herself. When a girl who may have become pregnant, destroys her child, to exculpate herself from the crime, she has only to liberate a male or a female slave.*

Even in *Iceland*, we find traces of this inhuman crime. The custom appears to have been derived from their Norwegian ancestors, among whom it continued to prevail for nearly one hundred years after it had been abolished in Iceland. It became extinct shortly after the introduction of Christianity into the Island, which event took place at the end of the tenth century.†

If we turn our attention from the OLD WORLD, and direct it to the NEW, we shall find this crime presenting itself under forms no less horrible and disgusting.

Among the natives about *Hudson's Bay*, it is common for the women to procure abortion by the use of a certain herb which grows there.‡

In *Labrador*, the Moravian missionaries who first landed there, found it a prevailing custom to put to death their widows and orphans; not to gratify a natural ferocity of disposition, but merely on account of a supposed inability to provide the means of support for the helpless orphan or the desolate widow of another. By the exertions of the missionaries, the practice was arrested.§

* See a Letter on the State of Legal Medicine in Egypt, by Hamont, Directeur of the Veterinary School of Medicine, of Abon-Zabel, in the Annales d'Hygiène Publique et de Médecine Légale, vol. 10, p. 202–3.

† Dr. Holland's Preliminary Dissertation on the History and Literature of Iceland, in Sir G. Mackenzie's Travels in the Island of Iceland, during the summer of the year 1810, Edinburgh 2d Ed. p. 39.

‡ Ellis' Voyage to Hudson's Bay, p. 193.

§ Barrow's Account of a Journey in Africa in 1801 and 2. (Edinburgh Review, vol. 3, p. 433.)

Nor were the savages of these inclement regions the only people who were guilty of this horrid crime. The gloomy superstition of the *Mexicans* delighted in human sacrifices, and the altars of their divinities were continually drenched with the blood of infants and of men.* The number of these sacrifices has doubtless been exaggerated, but the fact is unquestionable, that countless victims poured forth their lives to appease or conciliate their imaginary deities.

The mothers in *California* are described as voluntarily destroying their offspring. Venegas states that the common cause of it was a scarcity of food, and that the practice was put a stop to by the Father Salva-Tierra, who ordered a double allowance to be given to women newly delivered.†

Charlevoix describes a race of savages in North America, who make a practice of destroying all infants who are so unfortunate as to lose their mothers before they are weaned; at the same time, they inter alive all the other children, upon the plea that no other female can nurse them properly.‡

The *Peruvians*, whom Dr. Robertson eulogizes for the mildness of their manners, and the benevolent spirit of their religion,§ were nevertheless in the habit of sacrificing children. Acosta tells us, that in such cases as the sickness of the Inca, or doubtful success in war and other affairs, ten children were sacrificed; and upon the coronation of the Inca, two hundred were offered up. When a Peruvian father was taken sick, he sacrificed his son to *Viriachocha*, (the sun,) beseeching him to accept the life of his child, and to save his own. The same writer, when comparing the Peruvians and Mexicans, describes the former as exceeding the latter in the sacrificing of *children;* while the latter were chiefly addicted to the sacrifice of *men* taken in battle, of whom they murdered an immense number. Robertson endeavours to rescue them from this charge, by invalidating the testimony of Acosta. He cannot, however, help confessing that the practice did prevail

* Robertson's History of America, vol. 3, p. 325.

† History of California, by Miguel Venegas. London, 1759. Vol. 1, p. 82.

‡ Journal d'un Voyage à L'Amerique Septentrionale, par le P. De Charlevoix. A Paris, 1744. Vol. 3, p. 368.

§ History of America, vol. 3, p. 335.

among "their uncivilized ancestors;" but he adds, "that it was totally abolished by the Incas, and that no human victim was ever offered in any temple of the sun." He admits, moreover, that "in one of their festivals, the Peruvians offered cakes of bread moistened with blood drawn from the arms, the eyebrows and noses of their children. This rite may have been derived," he says, "from the ancient practice in their uncivilized state, of sacrificing human victims."*

Besides those that have been enumerated, travellers record the names of other tribes and nations inhabiting this vast continent, who murder their children with impunity and without remorse. They tell us of the *Abiponians*, a migratory race, inhabiting the province of Chaco in Paraguay, among whom mothers have been known to destroy all their children as soon as they were born;† and of the *Araucanians*, a powerful nation of Chili, who permit fathers and husbands to kill their children and wives.‡

To the honour of our *North American Indians*, it deserves to be mentioned, that they are not known to be guilty of this horrid crime. Mr. Heckewelder, in his interesting account of the Indians who inhabited Pennsylvania and the neighbouring states, says, "I have never heard of any nation or tribe of Indians who destroyed their children, when distorted or deformed, whether they were born so, or come to be so afterwards."§ To the same effect are the testimonies of Captain Franklin and Dr. Richardson, both of whom represent infanticide as an exceedingly rare occurrence, and when an occasional instance of it takes place, is looked upon by them as a crime of the greatest magnitude. Dr. Richardson, in his interesting account of the Cree Indians, in giving their belief in relation to a future state, says that it is a crime which they believe to be punished hereafter. "Women who have been guilty of infanticide, never reach the Mountain (the Indian

* History of America, vol. 3, p. 429.

† Edinburgh Encyclopædia, Art. *Abiponians*.

‡ Ibid. Art. *America*.

§ A Narrative of the Mission of the United Brethren among the Delaware and Mohegan Indians, from its commencement in the year 1740, to the close of the year 1808, &c. By John Heckewelder, who was many years in the service of that mission. 8vo. Philadelphia. p. 216.

heaven) at all, but are compelled to hover round the seats of their crimes, with branches of trees tied around their legs."*

But it is unnecessary to extend this sketch any further. Enough has been recorded to give a view of the wide-spread desolations of this unnatural crime; certainly too much for the honour of human nature.

PART II.

Infanticide in its relations to medical jurisprudence.

By INFANTICIDE in its most extensive signification, is understood, the criminal destruction of the fœtus in utero, or of the child after it is born. It embraces, therefore, two subjects, somewhat distinct, and which require separate discussion.

I. *Of the murder of the fœtus in utero, with an account of its various proofs and modes of perpetration.*

This is usually called *criminal abortion.* Recently the more appropriate and classical term of *fœticide* has been applied to it. In the following essay, these terms will be used indiscriminately.

In every instance in which a reputed case of fœticide becomes the subject of legal investigation, the great points which present themselves are the following:

1. Has the fœtus in utero been actually destroyed?

2. Has this been brought about by *intentional means*, or by *accidental and natural causes?*

These are the questions concerning which the opinion and testimony of the professional witness will be required; and these, therefore, are the subjects which it becomes necessary specially to examine. Before proceeding, however, to the discussion of these points, it becomes necessary to settle a preliminary question of great importance, and which is to determine, if possible, the period of gestation when the fœtus is to be considered as endowed with life.

* Journey to the Shores of the Polar Sea, in 1819-20-21-22: With a Brief Account of the Second Journey, in 1825-26-27. By John Franklin, R. N. Vol. 1, p. 151. London, 1829.

In reviewing the various opinions which have been advanced on this subject at different periods, it will abundantly appear, that too often fancy has usurped the prerogative of reason, and idle speculation been substituted in the place of rational investigation. The consequence has been, that doctrines have been promulgated, not only the most erroneous and absurd in their nature, but the most dangerous in their tendencies to the best interests of society.

The ancients were by far the most extravagant in their notions on this subject. The same fundamental error, however, pervaded all their theories. They believed that the sentient and vital principle was not infused into the fœtus, until some time after conception had taken place. It is not surprising that the exact time at which this union is effected, could never be satisfactorily settled by them. According to *Hippocrates*, the male fœtus became animated in thirty days after conception; while the female required forty-two.* In another part of his works, he asserts that this does not occur until the perfect organization of the fœtus.

The *Stoics* believed that the soul was not united to the body before the act of respiration, and consequently that the fœtus was inanimate during the whole period of utero-gestation.† This doctrine prevailed until the reigns of Antoninus and Severus, when it gave way to the more popular sentiments of the sect of the *Academy*, who maintained that the fœtus became animated at a certain period of gestation. The *Canon Law* of the Church of Rome also distinguished between the animate and inanimate fœtus, and punished the destruction of the former with the same severity as homicide.‡

Galen considers the animation of the fœtus to take place on the fortieth day after conception, at the same time that he supposed the fœtus to become organized.§

Others believed shorter periods sufficient; and accordingly three days and seven have respectively had their advocates.‖ Another contends that eighty days are requisite for the ani-

* Lib. de Nat. Puer. Num. 10.
† Plutarch's Morals, vol. 3, p. 230. London.
‡ Zacchiæ Quæst. Med. Leg. lib. ix. tit. 1, 2, 5, p. 744.
§ Opera Galeni, de Usu Part. lib. 15, cap. 5. Lugduni, 1643.
‖ Zacchiæ, lib. 1, tit. 2, Q. x. p. 82.

mation of the female, while only forty are necessary for the male.* Some advocate forty days as sufficient for both.† Others again make a distinction between the imperfect embryo and the perfectly formed fœtus, and consider abortion of the latter only as a crime deserving the same punishment as homicide; a distinction, of which it is justly remarked by a celebrated writer on medical jurisprudence, "ennemie de la morale et de l'humanité, digne de l'ignorance et des préjugés de ses auteurs."‡

Amidst these discordant sentiments, Zacchias offers himself as a mediator, and proposes sixty days as the limit; and recommends that any one who should cause an abortion after that period, whether of male or female, should be punished for homicide.§

All the foregoing opinions, wholly unsupported either by argument or experiment, might be dismissed without a comment, were it not to point out the evils to which they have given rise. It may be said of them with perfect truth, that their direct tendency has been to countenance, rather than to encourage abortion, at least in the earlier stages of pregnancy. On a subject of this nature, it was to be supposed that legal decisions would be influenced in a great measure by the opinions of philosophers and physiologists; and accordingly, while the delusion of the Stoics continued its sway, the law could view nothing very criminal in wilful abortion,‖ as the fœtus was considered merely portio viscerum matris.¶ And afterwards, when the Academicians flourished, punishments very different, in the degree of their severity, were inflicted, according as the abortion was supposed to be that of an animate or inanimate fœtus.**

In modern times, an error no less absurd, and attended with consequences equally injurious, has received the sanction, not merely of popular belief, but even of the laws of most civilized countries. The error consists in denying to the fœtus any vitality until after the time of quickening. The codes of

* Zacchiæ, lib. 1, tit. 2, Q. x. p. 82.
† Ibid.
‡ Foderé, vol. 4, p. 484.
§ Zacchæ, lib. 1, tit. 2, Q. x. p, 83.
‖ Foderé, vol. 4, p. 382.
¶ Plutarch's Morals, vol. 3, p. 230.
** Foderé, vol. 4, p. 382.

almost every civilized nation have this principle incorporated into them; and accordingly, the punishment which they denounce against abortion procured after quickening, is much severer than before. The *English law* "considers life not to commence before the infant is able to stir in its mother's womb."* The *law of Scotland*, adopting the creed of the Stoics, believes the fœtus in utero, previous to quickening, to be merely pars viscerum matris. In *Saxony*, in consequence of the disputes of medical men on this subject, it was formally decided, that the fœtus might be esteemed alive after the half of pregnancy had gone by.†

The absurdity of the principle upon which these distinctions are founded, is of easy demonstration. The fœtus, previous to the time of quickening, must be either dead or living. Now, that it is not the former, is most evident from neither putrefaction nor decomposition taking place, which would be the inevitable consequences of an extinction of the vital principle. To say that the connexion with the mother prevents this, is wholly untenable: facts are opposed to it. Fœtuses do actually die in the uterus before quickening, and then all the signs of death are present. The embryo, therefore, before that crisis, must be in a state different from that of death, and this can be no other than life.

But if the fœtus enjoys life at so early a period, it may be asked, why no indications of it are given before the time at which quickening generally takes place? To this it may be answered, that the absence of any consciousness on the part of the mother, relative to the motions of the child, is no proof whatever that such motions do not exist. It is a well known fact, that in the earlier part of pregnancy, the quantity of the liquor amnii is much greater in proportion to the size of the fœtus, than at subsequent periods. Is it not, therefore, rational to suppose, that the embryo may at first float in the waters without the mother being conscious of its movements, but that afterwards, when it has increased in bulk, and the waters are diminished in proportion, it should make distinct

* Blackstone, vol. 1, p. 129.

† Specimen Juridicum Inaugurale. Auctore Van Visvliet. p. 46. Lugduni Batavorum, 1760.

and perceptible impressions upon the uterus? Besides, it should not be forgotten, that fœtal life at first must of necessity be extremely feeble, and therefore it ought not to be considered strange that muscular action should also be proportionably weak.

But granting, for the sake of argument, that the fœtus does not stir previously to quickening, what does the whole objection amount to? Why, only that one evidence of vitality, viz. motion, is wanting; and we need not be told that this sign is not essential to the existence of life.*

The *incompleteness* of the embryo previous to quickening, is no objection to its *vitality*. Life does not depend upon a complication of organs; on the contrary, it is found that some of the simplest animals, as the polypi, are the most tenacious of life. Besides, upon this principle, vitality must be denied to the child after birth, because many of its bones, as well as other parts of its body, are imperfect.

Nor is the *want of organic action* any argument against this doctrine. Life appears to depend essentially as little upon organic action, as it does upon a complication of organs. If it did, the fœtus, after quickening, would be just as destitute of life as before, for its brain, lungs, stomach, and intestinal canal, perform no more action at the eighth month than they do at the third. But if organic action be essential to life, how are we to account for those singular cases of fœtuses born alive, and yet destitute of some of the most important organs in the body, such as the head, brain, &c.?† And how are we to explain those temporary suspensions of organic action in the bodies of adults, which sometimes happen, without the principle of life being extinguished?

The observations of physiologists tend also to prove the vitality of the fœtus previously to quickening. Long before quickening takes place, motion, the pulsation of the heart, and

* There is a difference of opinion as to the real nature of quickening. It has been lately suggested by a writer, that it is altogether independent of any motion of the child, and that it is to be attributed to the sudden rising of the uterus out of the pelvic cavity into the abdomen. (London Med. and Phys. Journal, vol. 27, p. 441.) If this opinion be true, it would afford another incontrovertible argument in favour of the position which I have advocated.

† Saumarez' Physiology, vol. 2, p. 21; Review of Sir E. Home's paper on the Functions of the Brain; Edin. Review, vol. 24, p. 439.

other signs of vitality have been distinctly perceived. Haller, indeed, asserted, "that all the viscera and bones of the future fœtus, nearly fluid indeed, and therefore invisible, were preformed before conception in the maternal germ." However objectionable such an opinion may be, yet the fact is certain, that *the fœtus enjoys life long before the sensation of quickening is felt by the mother*. Indeed, no other doctrine appears to be consonant with reason or physiology, but that which admits the embryo to possess vitality from the very moment of conception.

If physiology and reason justify the position just laid down, we must consider those laws which exempt from punishment the crime of producing abortion at an early period of gestation, as immoral and unjust. They tempt to the perpetration of the same crime at one time, which at another they punish with death. In the language of the admirable PERCIVAL, "to extinguish the first spark of life, is a crime of the same nature, both against our Maker and society, as to destroy an infant, a child, or a man: these regular and successive stages of existence being the ordinances of God, subject alone to his divine will, and appointed by sovereign wisdom and goodness, as the exclusive means of preserving the race, and multiplying the enjoyments of mankind."*

Having thus endeavoured to show that there is no period of gestation at which the fœtus is not to be considered alive, I come now to take up the consideration of the questions originally proposed.

1. *Has the fœtus in utero been actually destroyed?*

The proofs to establish this, are to be drawn from two sources, viz: From an examination of the reputed mother,—and an examination of the fœtus.

Of the signs of abortion to be deduced from an examination of the female.

In the early months of pregnancy, it is extremely difficult to ascertain whether an abortion has taken place or not. The fœtus has scarcely had time to make those firm attachments

* Percival's Works, vol. 2, p. 430-31.

which afterwards unite it to the womb; nor has it attained to a size sufficient to produce those general changes in the constitution of the mother, nor those local alterations from the distention of the uterus and abdomen, which are afterwards occasioned. Its separation, therefore, is unattended by violence, and leaves but faint, if any traces of its previous existence. The hæmorrhage attending it is also of small consequence, inasmuch as the uterine vessels have not yet sustained any great enlargement, and therefore very speedily contract. The period to which these remarks more particularly apply is the two first months of pregnancy, during which it is conceded that no satisfactory opinion can ever be formed from an examination of the female.* After this period, and just in proportion to the approach to the full term, will the signs be more decisive and satisfactory. For obvious reasons, I shall describe them such as they will be found when existing in their most marked and defined character, and these are the same as those which occur after ordinary delivery.

The signs are deduced from three different sources, viz:— From the *condition of the organs of generation themselves*;— from the *condition of the abdominal parietes*;— and from the *condition of the breasts.*

1. *Condition of the organs of generation.* In consequence of the expulsion of the fœtus from the uterus, there are several striking changes which take place in these organs, from which important conclusions may be drawn. The more characteristic of these are the following:

Labia and perineum. The labia will be found, on examination, to be tumified and relaxed, and of a dark red colour; while in some cases the anterior edge of the perineum, called the fourchette, will be lacerated. These changes, of course, are owing to the unnatural irritation and distention which

* Manuel de Médecine Légale. Par J. Briand. p. 67.— A Manuel of Medical Jurisprudence, by M. Ryan, M. D. Edited by R. E. Griffith, M. D. p. 129. — Marc, Dictionnaire de Médecine, vol. 3, p. 193. — Dr. Montgomery, in his valuable paper on the signs of pregnancy and delivery, relates the case of a lady to whom he was called, who miscarried at the end of the second month. In twenty-four hours afterwards, he found the os and cervix uteri almost completely restored to their natural state; the vagina and external parts hardly if at all dilated, and very little relaxed; and the breasts exhibited very imperfectly the appearances which accompany pregnancy, the ordinary sympathetic symptoms of which had been almost entirely absent. (See Cyclopædia of Practical Medicine, vol. 3, p. 501.)

these parts have necessarily undergone during the passage of the fœtus.

Vagina. On introducing the finger into this organ, it will be found preternaturally enlarged and relaxed, from the same cause as the preceding. From the distention which it has suffered, its natural rugæ will also be obliterated, and its inner surface in consequence rendered smooth.

Os and cervix uteri. On examining with the finger immediately after delivery, the neck of the uterus will be indistinct, and the mouth of that organ so dilated as to be scarcely distinguishable from the cavity of the vagina. When it is discovered, its edges will be found to be soft and flabby, and so open as to admit of the introduction of two or more of the fingers. After delivery, the os uteri gradually contracts, but never or "rarely closes to the same degree as in the virgin state."*

Uterus. This is to be examined through the abdominal parietes. On applying the hand to the abdomen immediately after delivery, this organ will be readily detected just above the pubes, in the shape of a hard round ball about the size of the child's head. It is during the first week after delivery, that the uterus is to be felt most distinctly in this situation; after this, the uterine tumour gradually lessens, and becomes more and more indistinct. It is at least a month, according to Burns, before the uterus returns to its natural dimensions.†

The lochia. This is a discharge which takes place from the uterine organs immediately after the completion of delivery, and continues for a certain number of days. At first it is pure blood, and continues so during the first two or three days after delivery. It then changes to a paler colour, and finally assumes a whitish appearance. In some cases it eventually becomes of a dark dirty green aspect, when it is known by the name of the "*green waters.*" Now as this discharge comes from the relaxed and ruptured vessels of the uterus, and as its cessation depends upon the contraction of these vessels, it is evident that not merely its quantity, but its duration, must

* Burns's Midwifery, p. 564. Seventh American edition.

† Burns's Midwifery, p. 564.

vary very greatly, according to the particular condition of the patient, and the greater or less rapidity with which the uterine vessels contract. Accordingly, it will be found that in some cases this discharge ceases in ten or twelve days, while in others it continues to the twenty-fifth or thirtieth day, and sometimes even longer.* Attending this discharge, there is an odour so peculiar that it can always be recognized by those at all conversant with it, and which is not present in any other discharge from the uterine organs.

2. *Condition of the abdominal parietes.* The circumstances indicative of delivery, in connexion with the abdominal parietes, are their flaccidity, and the presence of the lineæ albicantes.

Flaccidity of the abdomen. On examining the surface of the abdomen after delivery, besides detecting the uterine tumour, which has been already mentioned, the abdomen will be found soft, relaxed, and frequently lying in folds. So great is this relaxation of the parietes sometimes, that they may be almost folded round the hand. This is more especially observed in those who have borne a number of children.

Lineæ albicantes. These are shining whitish lines, to be seen on the surface of the abdomen, extending chiefly from the groins to the navel. They arise from the great distention and cracking of the skin during pregnancy, and remain frequently permanent for life :† They are not, therefore, to be looked upon as the evidences of recent delivery.

3. *Condition of the breasts.* The phenomena connected with the breasts as evidences of delivery, are their enlargement, the secretion of milk, and the presence of the areola.

Enlargement of the breasts. About the third month of pregnancy, the breasts begin to enlarge, and continue to do so until they frequently become double their original size; at the same time they become tender and painful, and have a firm lumpy feeling. After delivery, particularly if examined about the third or fourth day, they will be found full and tense.

* See an Elementary Treatise on Midwifery, by A. L. M. Velpeau, M. D. Translated by C. D. Meigs, M. D. p. 579. A Compendious System of Midwifery, &c. by William P. Dewees, M. D. p. 210.

† Foderé, vol. 2, p. 9.

Secretion of milk. This is another sign of pregnancy and delivery. It is important, however, to recollect that too much stress should not be laid upon this, apart from other indications, inasmuch as it frequently takes place independently of both. Dr. Blundell relates the case of a female who had not had a child for three years; she had not suckled for some time previously, and was not pregnant, and yet the secretion of milk was so active that it flowed freely on the least pressure of the breast.* Another case is related by him, of a negress who secreted milk for twenty years after her pregnancy.†

Areola around the nipple. In the virgin state, the nipple is surrounded by a circular discoloration of the skin, which is generally of a rosy tint, sometimes merely a little lighter than the natural skin. During the pregnant state, this undergoes striking changes. It becomes broader and darker, being converted into "a coppery red, or a dark mahogany brown."‡ The diameter of this circle averages from one inch to one inch and a half. Both the extent and colour of the areola differ considerably in different persons.§ After a first pregnancy, it is to be recollected that the areola remains more or less permanent; it is therefore not to be looked upon as a criterion of a recent delivery. Of all the individual signs, this is one of the most certain, and may be depended upon with a good deal of confidence, provided the discoloration be very decided, and the female has not borne children previously.

* Blundell's Midwifery, p. 112. American edition.

† Ibid. p. 112.

‡ Ibid. p. 113.

§ Dr. Montgomery records a case in which the diameter exceeded three inches. In negro women, the areola is almost jet black. (Cyc. Prac. Med. vol. 3, p. 474.)

Dr. Montgomery, who has paid especial attention to this subject, describes other features besides mere colour, as characterizing very strikingly the areola. His words are the following: "In the centre of this circle, (the areola,) the nipple is observed partaking of the altered colour of the part, and appearing turgid and prominent; and the part of the areola more immediately around the base of the nipple, has its surface rendered unequal by the prominence of the glandular follicles, which, varying in number from twelve to twenty, project from the sixteenth to the eighth of an inch: and lastly, the integument covering the part is observed to be softer and more moist than that which surrounds it, and the breasts themselves are at the same time observed to be full and firm, at least more so than was natural to the person previously. Such we believe to be the essential characters of the true areola, the result of pregnancy; and that, when found possessing these distinctive marks, it ought to be looked on as the result of that condition alone, no other cause being capable of producing it." (Cyclopædia of Practical Medicine, vol. 3, p. 474.)

Such are the signs deduced from the female, by which it is to be determined whether a delivery has taken place. From the account given of them, it is evident that many are necessarily evanescent in their character; and therefore, in order to obtain the fullest amount of testimony from them, the examination should be instituted as speedily as possible after delivery has taken place. With regard to the latest period after delivery, at which a satisfactory decision may be made, some difference of opinion has existed. The period fixed upon by medical jurists generally, is from the eighth to the tenth day.* After this, many of them become too obscure to be relied on with any degree of certainty.

Relative value of the preceding signs of delivery. In relation to the foregoing signs, it is essential to recollect that all of them have been objected to as uncertain, inasmuch as almost every one of them may be produced by other causes than delivery. Thus, for example, the enlargement and relaxation of the external parts may arise from simple menstruation; the dilatation of the vagina and os uteri, and the enlargement of the uterus, may arise from hydatids or moles; the relaxation and marked state of the abdomen may arise from dropsy; even the areolæ around the nipples, as well as the secretion of milk, may arise from other causes than pregnancy and delivery.

Now it must be admitted that all these objections are, to a certain extent, well founded; and they go to show that no one sign, taken by itself, ought to be considered sufficient to establish the fact. In all cases, a *number of the signs* should concur before any satisfactory conclusion can be formed. If this general caution be observed, the force of all the preceding objections will be materially weakened. Thus, for instance, *menstruation* may relax the vagina and external parts, at the same time that it causes a discharge from these organs. In this case, however, all the other signs will be absent. The peculiar odour of the lochia will be wanting; there will be no dilatation of the os uteri— no enlargement of the uterus— no wrinkling of the abdominal parietes—no secretion of milk, and

* Paris and Fonblanque, vol. 1, p. 252. Foderé, tom. 2, p. 87. Montgomery in Cyclopædia of Practical Medicine, vol. 3, p. 503. Griffith's Ryan, p. 133.

no areola around the nipples. Again, *dropsy* may cause a great relaxation and wrinkling of the abdomen. I say *may*, because, generally speaking, unless the dropsical fluid be suddenly removed by tapping, this will not happen, as in ordinary cases the fluid is removed so gradually that the abdomen has time to contract, and accommodate itself to the change. Admitting, however, that these signs of pregnancy may be counterfeited by dropsy, so many others will be absent as to leave no doubt in the case. The vagina and external parts will not be affected; the os uteri will not be dilated; the uterus will not be enlarged; the breasts will have undergone no change, and there will be no lochial discharge.

With regard to the *secretion of milk* from other causes than pregnancy, this is a fact which cannot be denied. But in cases of this sort so many of the other signs of delivery will be absent as to obviate any difficulty that may arise.

As to the objections founded on the existence of hydatids, it must be confessed that much more difficulty attends a correct decision. These however I shall consider fully under the next head.

Of the signs of abortion in cases in which the delivery is followed by the death of the female.

Cases of this kind sometimes occur, and it then becomes the duty of the professional man to prosecute his researches still further by an anatomical inspection of the uterus and its appendages.

The uterus. In this organ, various appearances will be detected, indicating the fact of its having contained a fœtus.

Its *size* will be different from that of the unimpregnated uterus. In the unimpregnated state, the dimensions of the uterus may be put in round numbers at three inches for its length, two for its breadth at the fundus, one inch at the cervix, and one inch for its thickness. In the gravid state, it is evident that its size must vary considerably according to the size of the fœtus, and according to the quantity of liquor amnii.*

* An Anatomical Description of the Human Gravid Uterus and its contents. By the late William Hunter, M.D. p. 2.

A general average however, of its gradual changes in this respect may be put as follows:—During the first month, the uterus undergoes little or no change in its size.* During the second month it becomes considerably enlarged. About the end of the third month it will measure about five inches in length, of which the cervix will measure one inch. In the fourth month, it will measure five inches from the fundus to the beginning of the neck. In the fifth month, it will measure six inches from the fundus to the cervix. In the sixth and seventh months it will measure about eight inches, and in the ninth it will be from ten to twelve inches from the top to the bottom.†

Now in a case where a woman dies from hæmorrhage during labor, at the full time or immediately after, the uterus will be found like a large flattened pouch measuring from ten to twelve inches. In this case, little or no contraction having taken place, the dimensions of the uterus are little changed from what they were anterior to labor. If however uterine contractions should have taken place, the dimensions of the uterus would be considerably less. If some days had elapsed, the size would of course be still more diminished. If the examination be made about two days after delivery, the uterus will be about seven inches long. At the end of a week, it will be about five or six inches,‡ and at the end of a fortnight about five inches long.

Its *shape* will be different from what it is in the unimpregnated state. In the unimpregnated state, the uterus is a flat body, pyriform or somewhat triangular in its shape. During the first two months of pregnancy its shape remains unchanged; after this, the body of it becomes globular, without any material change having taken place in the neck, until about the fifth month. After this the neck grows shorter and broader, until in the two last months it is almost entirely obliterated, and forms a part of the general cavity of the uterus. The shape of the uterus is now completely ovoid. Now if death

* Maygrier's Midwifery, p. 81.

† Burns' Midwifery, pp. 185, 563.

‡ According to Burns, "a week after delivery, the womb is as large as two fists." (Midwifery, p. 564.)

takes place during or immediately after labor, the shape of the uterus will be ovoid, or if contractions have taken place, it will be globular. If on the other hand, several days have elapsed, it will have regained somewhat of its pyriform shape.

Thickness of the uterus. On this point contradictory accounts are given. At the full time however, and when the uterus is still distended with its contents, its thickness varies very little from that before impregnation; in some cases even it appears to be thinner;* according to Hunter, its more common thickness is from one to two thirds of an inch.† Generally speaking too, the uterus is thickest at its fundus, and especially where the placenta has been attached. When, however, the examination is not made until some hours or days after delivery, and the uterus has had time to contract, it will then be found thicker than natural. In that state it will often be found two inches thick.‡ It is well enough to recollect that gravid uteri, when injected, are much thicker than in their natural state.§

Uterine blood-vessels. There is nothing in connexion with the pregnant uterus more striking, than the great enlargement which the blood-vessels have undergone. Both the arteries and veins, but more especially the latter, are enormously enlarged from their natural dimensions. This is most strikingly observed in that portion of the uterus to which the placenta is attached.‖ The arteries will be found from the size of a goose quill to that of a crow quill, and downwards,¶ and the veins will be found much larger. In some cases, the orifices of the veins opening into the uterus from the surface where the placenta has been attached, are large enough to admit the extremity of the little finger.**

Inner surface of the uterus, and the placental mark. If the examination be made shortly after delivery, the cavity of

* Monro in the Edinburgh Essays and Observations, Physical and Literary, vol. 1, p. 418. See also Hunter on the Gravid Uterus, p. 15.

† An Anatomical Description of the Human Gravid Uterus and its Contents. By Williamm Hunter, M.D. p. 15. ‡ Ibid. p. 15.

§ Edinburgh Essays and observations, vol. 1, p. 418.

‖ Hunter on the Gravid Uterus, p. 17.

¶ Edinburgh Essays and Observations, vol. 1, p. 427, 435.

** Ibid. vol. 1, p. 412.

the uterus will be found to contain coagula of blood, or a bloody fluid. The part of the uterus to which the placenta has been attached, will be very visible, and corresponding in size to the placenta. This part will be of a dark colour, and have a gangrenous appearance; the vessels leading to it will also be much more enlarged than those of any other portion of the uterus.

Ligaments of the uterus. These undergo great changes. The *broad ligaments* will be found effaced, in consequence of the fundus of the uterus enlarging and rising, so as to stretch them into a uniform covering of the uterus. This, of course, is only at the full term of pregnancy; at earlier periods, the condition of these ligaments will vary according to the enlargement which the uterus may have undergone. The *round ligaments* will be found much elongated, and thicker than in the ordinary state. In this enlarged state, they are about the thickness of the little finger; while in their natural state, they are not thicker than a crow quill. They are also exceedingly vascular—so much so, that when injected, "they seem to be little more than a bundle of arteries and veins."*

Fallopian tubes. These will be found less convoluted—larger, and much more vascular than in the unimpregnated state. So great is this vascularity as frequently to give them a purplish appearance, looking very much as if they were in a state of inflammation. Generally the tube leading to the ovary from whence the ovum has escaped, will be found the most enlarged. Mr. Burns says, "the fallopian tube preserves its greater vascularity for a very considerable time, I cannot say how long, after delivery."†

Ovaria. These will be found but little different from the state anterior to impregnation, with the exception of the one from which the ovum has escaped, and which contains the *corpus luteum.* This ovarium can easily be identified by a peculiar fulness or prominence in one part of it, sensible both to the sight and touch, in the middle of which there is a small indentation like a cicatrix. On laying open the ovarium at

* Hunter on the Gravid Uterus, p. 13.

† Midwifery, p. 564.

this part, there will be found a body of a very distinct nature from the rest of the ovarium; this is the *corpus luteum.* It is sometimes round, but more generally oblong or oval. "Its centre is white, with some degree of transparency; the rest of its substance has a yellowish cast, is very vascular, tender and friable like glandular flesh."* Such is the appearance of the corpus luteum, if examined shortly after delivery at the full time. If examined, however, at other periods, these appearances will be considerably different. The earliest period after impregnation, at which the corpus luteum has been observed in the human subject, is in the case recorded by Sir Everard Home. Here the female died about eight days after impregnation; and on dissection, the right ovarium was found to have a small torn orifice upon the most prominent part of its external surface. On slitting open this orifice, it led to a cavity filled with coagulated blood, and surrounded by a yellowish substance.† The blood is gradually absorbed, and the cavity becomes lined with a white membrane. During the earlier months, a fluid will be found in the cavity.‡ Its dimensions after this become gradually contracted, and in the third or fourth month, it is about large enough still to contain a grain of wheat; after this it is completely obliterated, and in its place there is left a central white radiated cicatrix.§ This cicatrix is looked upon by Dr. Montgomery as a distinguishing characteristic of a genuine corpus luteum.‖ This cicatrix is not permanent, but disappears at about five months after delivery.

Such is the corpus luteum. It is largest and most vascular in the earlier periods of pregnancy; less so at delivery; and disappears altogether, according to the observations of Dr. Montgomery, at about five months after delivery.

Relative value of the preceding signs drawn from an exami-

* Hunter on the Gravid Uterus, p. 14.

† Philosophical Transactions for 1817, part 1.

‡ Hunter on the Gravid Uterus, p. 74.

§ Montgomery in Cyclopædia of Practical Medicine, vol. 3, p. 497.

‖ "Of this latter appearance, (the radiated cicatrix,) it ought to be observed here, that it is visible as long as any distinct trace of the corpus luteum remains, and forms an essential character, distinguishing this body from every other that might be confounded with it." (Ibid. p. 497.)

nation after death. Striking as the foregoing signs unquestionably are, objections of a very serious character may be made gainst them. As these objections have actually been brought forward in criminal trials, a notice of them is unavoidable. Of these, the only ones which require consideration, are, that all the appearances just described as found on dissection after delivery, may have been occasioned by the delivery of *hydatids* or *moles;* and that the corpora lutea may exist independent of pregnancy and delivery. Each of these objections I shall briefly notice.

1. *Hydatids.* Although not of very frequent occurrence, these are sometimes found existing in the uterus. They are small vesicles, hung together in clusters, and filled with a watery fluid. Their real nature is not exactly known, although they are supposed to be animals of a very simple structure. They sometimes exist in large masses in the uterus. The origin of these curious productions is by no means established. By some it is supposed that they may exist in the uterus itself, and originate without any connexion with impregnation. This, however, is by no means certain; and the probability is that they never occur *without sexual intercourse.** As commonly found, they appear to arise from the destruction of the ovum at an early period, or portions of the placenta remaining in the uterus after abortion or delivery, and degenerating into this kind of growth. Now it is very evident that some of the appearances and phenomena of pregnancy may be, and actually are, simulated by the presence of these substances in the uterus. Every phenomenon that depends upon the mere distention of the uterus, and the subsequent discharge of its contents, may thus be counterfeited. So far then as the mere external appearances go, it is frequently impossible to decide whether they originate from a real fœtus, or from hydatids. Even where there is no wish to conceal the real condition of the person, it is sometimes difficult to make up a positive opinion. Females have in this way been themselves deceived.

* Madame Boivin broadly asserts that hydatids are always the product of a degenerated conception, and that no virgin female can ever have them. (Nouvelles Recherches sur l'origine, la nature, et le traitement de la mole vésiculaire ou grossesse hydatique. Par Me. Boivin. Paris, 1827.)

Presuming themselves pregnant, the discharge of the hydatids has led them to suppose it a real miscarriage.* In cases like those of criminal abortion, where every effort is made at concealment, it is of course out of the question to say which was the cause;† and the only way to settle the question, is by an examination of what may have been actually discharged from the uterus. In cases where the abortion ends in the death of the female, although we have the benefit of the additional information furnished by dissection, still the inquiry is not unattended with difficulties; and it is by no means easy to decide whether the phenomena which are observed are the result of the expulsion of a real fœtus, or of hydatids. The following considerations must render this obvious. It has already been stated that, in all probability, hydatids are always the result of impregnation, the ovum, or some portion of the contents of the gravid uterus, being converted into this kind of growth. If this be so, a corpus luteum will be found, if the examination be made under favorable circumstances. Besides this, it has already been stated that every phenomenon connected with the enlargement of the uterus, and the dilatation of the os uteri, may also be produced by hydatids. Even the placental mark may be present. Cases therefore might occur, in which it would be impossible to distinguish between the two. I say *may*, because, generally speaking, in cases of hydatids, no placenta is found, and therefore they do not leave behind them any thing like the mark which is left by that body on the inner surface of the uterus. In cases of hydatids, the vesicles hang in clusters, attached by an intermediate membrane to the inner surface of the uterus.‡ This then would furnish one

* An Account of some of the most important Diseases peculiar to Women. By Robert Gooch, M.D. p. 216. American edition.

† Gooch, after relating some cases of hydatids, says, "In the progress of these cases, it is impossible to come nearer the truth than this—that the abdomen owes its enlargement to a distended uterus; but what this organ contains, is uncertain." (Ib. p. 218.)

‡ By Dr. Denman, they are described in the following manner: "Hydatids or small vesicles, hung together in clusters from *one common stem*, and containing a watery fluid, are sometimes formed in the cavity of the uterus." (Introduction to the Practice of Midwifery, p. 146. American edition.)

According to Dr. Baillie, "they consist of vesicles of a round or oval shape, *with a narrow stalk to each, by which they adhere to the outside of one another.* Some of these hydatids are as large as a walnut, and others as small as a pin's head. A large hydatid has generally a number of small hydatids adhering to it by *a narrow process.*" (Morbid Anatomy, p 136. American edition.)

mark of distinction. Another might be found in the different condition of the uterine bloodvessels. In cases of real pregnancy, the bloodvessels, especially those confined to the placental space, undergo a much greater enlargement than when hydatids alone are in the uterus. Independently, however, of all these considerations, there is not practically after all so much difficulty in these cases as might be anticipated. If hydatids are always the result of a degenerated conception, then the fact of impregnation is conceded; and this, after all, is the great point to be established in these cases. If, on the other hand, hydatids have no connexion with conception, then the question will be at once decided by the placental mark, but more especially by the existence of the corpus luteum.

Besides all this, in cases where the signs of delivery are alleged to be owing to hydatids, it is but reasonable to expect that these should be adduced in evidence, and in that case of course, all difficulty will at once be obviated.

2. *Moles.* These are peculiar substances contained within the cavity of the womb. They consist of a membrane enclosing generally a quantity of coagulated blood. Frequently however, they appear of a fleshy structure without any blood. In their size, consistence and structure they differ very much in individual cases. They occur too, under a variety of circumstances. They have been met with in females who have never been married, or borne any children. In some cases they have followed a natural delivery, or a miscarriage; while in others they have accompanied certain diseased conditions of the uterus. By some it is supposed that these formations never take place in the *virgin state.* Mr. Burns says he has never met with a case contradictory of such a supposition.* That they may, however, occur occasionally without any sexual intercourse, appears to be pretty well established. Now in these cases, many of the symptoms of actual pregnancy are present. The abdomen becomes enlarged; the stomach is affected with nausea; and even the breasts become swollen.† Here then also, as in the case of hydatids, it is im-

* The Principles of Midwifery, p. 127.

† Ibid, p. 127.

possible from mere external appearances to say whether these symptoms arise from genuine pregnancy or not.

In cases where death takes place, and dissection has been had, the same reasoning is applicable here as in cases of hydatids. If the mole be the product of a real conception, the great object of the investigation is at once conceded. If on the other hand, it be not the product of a real conception, then the examination of the placental mark and ovaria will indicate the fact.

3. With regard to the objection raised on the ground that the *corpora lutea are sometimes found in virgins*, and therefore are not to be looked upon as the infallible evidences of impregnation, it has been rendered more than doubtful whether a genuine corpus luteum is ever present except in cases of real pregnancy.*

Of the signs of abortion, deduced from an examination of what may have been expelled from the uterus.

Here there are three objects to be had in view, viz: To ascertain whether it be really a fœtus that has been expelled from the uterus; and if it be a fœtus, to ascertain its age; and lastly, to ascertain the cause of its expulsion.

1. *To ascertain whether it be really a fœtus which has been expelled.* From the difference in structure of the fœtus from hydatids and moles, it is scarcely possible that any mistake can be made in distinguishing them from one another, except in the very early months of pregnancy, say in the first two months; and at this early period, probably no medico-legal

* On this subject see the luminous investigations of Dr. Montgomery, in the Cyclopædia of Practical Medicine. According to him the appearances which are considered as corpora lutea occurring in virgins, differ from those of impregnation in all the following particulars: "1. There is no prominence or enlargement of the ovary over them: 2. The external cicatrix is wanting: 3. There are often several of them in both ovaries, especially in patients who have died of tubercular diseases: 4. They are not vascular, and cannot be injected: 5. Their texture is sometimes so infirm that they seem to consist merely of the remains of the coagulum, and at others appears fibro-cellular and resembling that of the internal structure of the ovary, but in no instance did we ever see them presenting the soft, rich, and regularly glandular appearance which Hunter meant to express when he described them as 'tender and friable like glandular flesh:' (Description of Gravid Uterus, p. 14.) 6. They have neither the central cavity nor the radiated cicatrix which results from its closure." (Cyclopædia of Practical Medicine, vol. 3, p. 502.)

investigation could ever be instituted with any satisfactory result.

2. *To ascertain the age of the fœtus.* This is important, inasmuch as it enables us to compare it with the appearances found on an examination of the female, to see how they correspond, and in this way to assist in detecting any imposition which may be attempted. In judging of the age of the fœtus, the circumstances more especially to be attended to are its *length — weight — and the relative situation of the centre of the body.*

Notwithstanding the various observations which have been made, it appears never yet to have been settled precisely, when the ovum enters the womb, or when the embryo first becomes visible. Mr. Hunter made a dissection in which impregnation was supposed to have taken place nearly a month previously, and yet no ovum was detected either in the fallopian tubes or in the uterus.* Mr. Burns states that he examined very carefully three uteri within the first month after menstruation, and in none could he discover an ovum.† By Sir Everard Home, however, a minute ovum was discovered as early as the eighth day after impregnation.‡ The period usually fixed upon, however, is from the nineteenth to the twenty-first day. When first seen, the ovum is in the state of a membranous egg, filled with a semi-transparent fluid, in the centre of which is the embryo. The parietes of it consist solely of two membranes, chorion and amnion. At first, the ovum is unattached to the uterus; afterwards it becomes united to it by means of the placenta.

At about *thirty days* after conception, the fœtus is about the size of a large ant, or, as it is described by others, of a barley corn.

At the end of *two months*, the fœtus is nearly two inches in length, and its weight about one ounce; at this time, the dif-

* Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. 2, p. 63.

† Principles of Midwifery, p. 189, Am. Ed.

‡ Philosophical Transactions for 1817.

Mr. Burns thinks that the soaking of the uterus in spirits, practised in this case by Sir E. Home, may have rendered the ovum more distinct, and thus enabled him to detect its existence. (Principles of Midwifery, p. 189.)

ferent parts of it are perfectly distinct, and even the sex can sometimes be distinguished.

At the end of *three months*, its length is from three to five inches, and its weight about three ounces.

At the end of *four months*, its length is from from six to seven inches, and its weight from four to five ounces.

At the end of *five months*, the length is from eight to nine inches, and the weight from nine to ten ounces. At this period, the abdominal parts begin to predominate over the thoracic parts.

At the end of *six months*, the weight is from one to two pounds, the length from eleven to twelve inches, and the centre of the body is at the abdominal extremity of the sternum.*

At the end of *seven months*, the length is from twelve to fourteen inches, the weight from two to four pounds, and the centre of the body is between the umbilicus and the lower part of the sternum, but rather nearer to the latter than the former.

At the end of the *eighth month*, the length is from sixteen to seventeen inches, the weight from three to five pounds, and the centre of the body between the umbilicus and the lower extremity of the sternum, but nearer to the former than the latter.

At the end of *nine months*, the length is from nineteen to twenty inches, the weight from five to eight pounds, and the centre of the body at the umbilicus.†

* For this criterion by which to judge of the age of the child, we are indebted to Chaussier. In the adult, the centre of the body is just above the pubis; in the child at birth, it is just at the umbilicus; at eight and seven months it is still higher, and at the sixth month, it is just at the lower part of the sternum. (Considerations Médico-Légales sur L'Infanticide. Par Lecieux. pp. 17, 18.)

† According to experiments made in the Parisian hospitals, the following results were obtained from fifteen hundred and forty-one children who were weighed at birth, and who, with the exception of eight or ten, appeared to have attained the full term.

3	weighed	2 pounds and some ounces.
31	.....	3
97	.....	4
308	.....	5
606	.....	6
380	.....	7
100	.....	8
16	.....	9
1,541		

It is very evident, however, that as it regards the *size and weight* of the fœtus, there must be a very great diversity. The foregoing may serve as a general average, at the same time that it may fail to be applicable in any individual case. Sometimes a fœtus of only six months, will be as large as another at the full time. In this case, however, notwithstanding its size, it will have all the signs of an immature fœtus, which cannot easily be mistaken. Its different members will be more or less imperfect; the colour of its skin will be lively red and transparent; the bones of the head will be soft, and the fontanelles very large; the hair will be very thin; the nails will be either wanting altogether, or very soft; there will be constant sleep, and an absence of the ordinary cries of the child; its movements will be feeble; and the discharge from the bowels will be either wanting altogether, or very small in quantity. All these signs will be found, of course, more or less strikingly marked, according to the approach of the fœtus to the full term.*

3. *To ascertain, if possible, what has been the cause of the miscarriage.* If the abortion has been occasioned by the use of drugs, &c. taken by the mother, nothing can be learned as to the cause of it, whether it be voluntary or involuntary, from any examination of the fœtus. In all cases its appearance will be very much the same, whatever may have occasioned its expulsion from the womb. As, however, it may have been produced by mechanical violence done to the fœtus itself, by the introduction of instruments, &c. it becomes necessary to examine it very carefully, and more especially its head, to discover the nature and extent of the wounds (if any) which may have been inflicted.

The average weight fixed upon by Chaussier and Lecieux for the child at full term, is 6¼ lbs. (Considerations sur L'Infanticide, par Lecieux, p. 9.)

With regard to the length of the child, as the result of numerous observations, the following are fixed upon by Chaussier and Lecieux as the average:

At 5	months,	9½ inches.
6	.....	12
7	.....	14
8	.....	16
9	.....	18

(Considerations sur L'Infanticide, par Lecieux, p. 12.)

* Manuel de Médecine Légale. Par J. Briand. pp. 66, 67. 1821.

II. *Of the means by which the death of the fœtus may have been produced.*

Having, in the foregoing manner, examined the first question to be solved, viz. whether a fœtus in utero has actually been destroyed, the second question relates to the causes by which it may have been produced.

The practice of causing abortion, is resorted to by unmarried females, who, through imprudence or misfortune have become pregnant, to avoid the disgrace which would attach to them from having a living child; and sometimes it is even employed by married women, to obviate a repetition of peculiarly severe labour-pains, which they may have previously suffered. But abortion is not always associated with crime and disgrace; it may arise from causes perfectly natural, and altogether beyond the control of the female. The physician should therefore be extremely cautious in his proceedings, even in cases of illegitimate pregnancy, and where the voice of popular prejudice seems to call upon the medical witness merely to confirm its previous, and often false decisions. The destruction of the fœtus may then result from two sets of causes. 1. The use and application of various criminal agents. 2. The ordinary and accidental causes which are known to produce it without any criminal interference. Each of these require examination, as in every trial of this kind, they may be made the subject of special inquiry by the court and jury.

1. *Of the criminal means resorted to for purpose of destroying the fœtus.*

These may be divided into general and local. To the first belong venesection, emetics, cathartics, diuretics, emmenagogues, &c. &c. The second embraces all kinds of violence directly applied.

Venesection. From the earliest periods it has been supposed that bleeding during pregnancy exercised some deleterious influence upon the fœtus, and that the repetition of it would infallibly destroy it. Hippocrates entertained this belief,* and it has accordingly long been resorted to as one of the popular

* Mulier uterum ferens abortit secta vena, eoque magis, si sit fœtus grandior. (Hippocrates, sec. 5, aphor. 31.)

modes of producing abortion. Bleeding from the foot has been supposed to be particularly effective in this way: all this is probably founded on the supposition that whenever blood is taken from the mother, the fœtus also loses a proportional quantity, and that by a frequent repetition of it, the latter may eventually be bled to death. Experience however, the most ample and satisfactory, has proved conclusively, that except in particular states of the constitution, venesection, however repeated and copious, can have no direct effect upon the fœtus; and further, that in many cases it is the most effectual agent in averting abortion. Mauriceau relates the history of two pregnant women, who were delivered at the full period, of living children, although one of them had been bled forty-eight times, and the other ninety times, for an inflammation of the chest.* By the same author, a case is recorded in which a person was bled ten times from the foot during pregnancy, without any bad effect on the fœtus.† Dr. Rush, in speaking of the effects of bleeding in the yellow fever of 1793, asserts that not one pregnant woman to whom he prescribed it, died, or suffered abortion.‡ In his defence of blood-letting, the same writer gives us the account of one woman whom he bled eleven times in seven days, during her pregnancy; of another, who was bled thirteen times, and of a third who was bled sixteen times while in the same condition. All these women, he adds, recovered, and the children they carried during their illness, were born alive and in good health.§ The foregoing facts, selected from a multitude of a similar character, are abundantly sufficient to show the extent to which venesection may be carried during pregnancy, without being attended with any injurious consequences to the fœtus; and the effect is the same, from whatever part of the body the blood is drawn, whether from the arm or from the foot.

In the cases just alluded to, it is true, blood was drawn during a state of disease, when the loss of a much larger quan-

* Capuron, p. 307.

† An Elementary Treatise on Midwifery, by A. L. M. Velpeau, M.D. Translated by C. D. Meigs, M.D. p. 236.

‡ Medical Observations and Inquiries, vol. 3, p. 309.

§ Ibid. vol. 4, p. 302.

tity can be borne than in ordinary health. Nevertheless, even in a state of health, the loss of a very large quantity of blood is not necessarily attended by any injurious consequences to the fœtus. On the other hand, it should be recollected, that when the constitution of the mother is naturally feeble and irritable, or has become much debilitated by disease, the injudicious loss of blood during pregnancy, may prove fatal to the fœtus. In all cases therefore, the question whether the bleeding has had any agency in producing the destruction of the fœtus must be determined by the particular circumstances of the individual case. At the same time, the mere fact of repeated bleedings having been resorted to without any obvious necessity for it, must be held as a sufficient evidence of the intention of the person.

Leeches. By some it is supposed that the application of *leeches* to the anus, insides of the thighs, or the vulva, has the effect of producing abortion. In this country, this practice is souncommon that we are hardly able to form any very correct opinion on the subject. A recent French writer, however, states that he has frequently applied leeches to these parts during pregnancy, in cases of intestinal affections, and in no instance did he find any bad consequences happen. At the same time he recommends great caution in the use of this remedy, especially in females who are liable to abort.*

Emetics. From the well known fact, that many women are troubled with distressing nausea and vomiting during the whole of their pregnancy, and yet are safely delivered of living children at the regular period, it has been supposed that the fœtus could not be much injured by the use of emetics. The fact however seems to be, that although the vomiting attendant upon pregnancy very seldom produces an abortion, yet that which is produced by emetics is not unfrequently followed by consequences the most serious both to mother and fœtus. In this opinion, I am supported by the authority of Mr. Burns, who says that "it is worthy of remark that abortion is very seldom occasioned by this cause, (the vomiting of preg-

* Etudes Cliniques sur les Emissions Sanguines artificielles. Par A. P. Isidore Poliniére. Tom. 1, p. 34.

nancy) though emetics are apt to produce it.* The reasons of the difference in the two cases may be the following. In the first place, the vomiting of pregnancy is less violent than that which is excited by artificial means; and in the second place, it occurs, as a general rule, only in the early months of pregnancy, when of course less danger attends the operation. Just in proportion to the size and development of the uterus, is the danger to be apprehended from the spasmodic contraction of the diaphragm and abdominal muscles during vomiting. In the latter months of pregnancy therefore, emetics prove much more dangerous than they do at an earlier period. Notwithstanding this, even emetics do not always succeed. Velpeau relates a case falling under his own observation, in which fifteen grains of *tartar emetic* were taken to produce abortion. Although violent efforts at vomiting were occasioned, yet the progress of the pregnancy was not interrupted.†

Cathartics. As a general rule, pregnant women are not apt to be injured by moderate purging. When attacked with disease too, they may be purged very freely without any risk. During the yellow fever of 1793, Dr. Rush informs us, that he gave large and repeated purges of calomel and jalap to many women in every stage of pregnancy, and in no case did any injury ensue to the child. Nay, he adds, that out of a great number of pregnant women, whom he attended in this fever, he "did not lose one to whom he gave this medicine, nor did any of them suffer an abortion. One of them had twice miscarried in the course of the two or three last years of her life. She bore a healthy child three months after her recovery from the yellow fever."‡ If, however, the purging should happen to be carried too far or be continued too long; if the article used be very drastic in its nature; if it act particularly on the rectum,§ (between which and the mouth of the uterus there appears to be a peculiar sympathy;) or if the female be of a nervous, irritable habit, then purging may be,

* The Principles of Midwifery, p. 230. Seventh American edition.

† Meigs' Velpeau, p. 236.

‡ Medical Observations and Inquiries, vol. 3, p. 249.

§ All those purgatives which produce tenesmus, are most apt to cause abortion. Hence it is too, that dysentery frequently produces this effect.

and frequently is followed by the death and expulsion of the fœtus. Purgatives, therefore, may or may not produce abortion, according to circumstances.*

Diuretics. This class of agents has long been supposed capable of producing abortion, and has accordingly frequently been used for this purpose. That they may have been occasionally attended with success, is very possible ; but I have no doubt that generally speaking they have failed. They certainly are destitute of any specific power of exciting uterine action. Mr. Burns seems to think that they are capable of bringing on abortion, and accordingly advises that they should be avoided during pregnancy.† Still, from his own language, I should not infer that he had ever witnessed this effect, although he says that he has seen diuretics given very freely to pregnant women laboring under ascites.‡ On the other hand, there are many positive facts on record to prove that diuretics may be taken with impunity by pregnant women. Zacchias relates the case of a female, who, after an interval of five years, considered herself pregnant, and shortly afterwards was attacked with sciatica. Several physicians and midwives were called to examine her, and decidedly unanimously, that she was not pregnant, particularly as she lost a little blood every month, though not so much as in menstruation. They therefore prescribed for the disease which afflicted her, bled her repeatedly in the foot, administered purgatives frequently, together with diuretics and sudorifics. All this did not prevent her from bringing forth a healthy child at the end of the expected time.‖

Concerning the *oil of juniper*, Foderé relates the following fact, which shews that this powerful article has failed in effecting an abortion. A pregnant female took every morning for twenty days, one hundred drops of the distilled oil of juniper, without injury, and was delivered of a living child at the expiration of the ordinary term.¶

* Dr. James Johnson states that he has known a very moderate dose of calomel and rhubarb to cause a premature delivery. (Medico-Chirurgical Review, vol. 17, p. 98.

† Principles of Midwifery, p. 283.

‡ Ibid. p. 288.

§ Ibid. p. 245.

‖ Foderé, vol. 4, p. 430.

¶ Foderé, vol. 4, p. 430.

Even *cantharides* has been taken in very large doses, with a view of procuring an abortion, without accomplishing the desired effect. "Some years ago," says Mr. James Lucas, one of the surgeons of the General Infirmary at Leeds, "I was called to a patient who had taken about a drachm of powdered cantharides in order to induce abortion, and which brought on frequent vomiting, violent spurious pains, a tenesmus and immoderate diuresis, succeeded by an acute fever, which reduced her to extreme weakness, yet no signs of miscarriage appeared, and about five months afterwards she was delivered of a healthy child."* Cases, however, have occurred in which cantharides has caused abortion. Dr. James Johnson mentions a case of this kind as occurring within his own knowledge.†

Nitre. Dr. Paris relates the case of a woman in Edinburgh, who having swallowed by mistake a handful of this salt, suffered abortion in less than half an hour.‡

Emmenagogues. Under this general head there are several articles which require notice. Among the more important are savine, mercury, polygala senega, and pennyroyal.

Juniperus sabina, (savine.) This is a powerfully stimulating article, and as an emmenagogue, has been used with considerable effect. It has also long been used for the purpose of producing abortion, and no doubt possesses considerable power in this way. Galen asserts that it acts with sufficient energy on the uterus to destroy the fœtus;§ and in the present day, it is said to be constantly used by the negresses in the Isle of France with this intention.‖

In the case of Miss Burns, for whose murder Mr. Angus was tried at Lancaster in 1808, there is reason to believe, from the testimony offered, that savine oil had been administered to effect an abortion. That it does not always succeed, is evident from a case related by Foderé. In 1790, a poor, imbecile, and cachectic girl, in the duchy of Aoust, in the seventh

* Memoirs of the Medical Society of London, vol. 2, p. 208.

† Medico-Chirurgical Review, vol. 17, p. 98.

‡ Medical Jurisprudence, by Paris and Fonblanque, vol. 3, p. 94.

§ Dictionnaire Matière Médicale, vol. 3, 696.

‖ Ibid.

month of her pregnancy, took from the hands of her seducer a glass of wine, in which there was mixed a large dose of powdered savine. She became so ill, that report of it was made to the magistrate, who ordered Foderé to visit her. The patient stated to him, that on taking the drug, she had felt a burning heat, accompanied with hiccup and vomiting. This was followed by a violent fever, which continued for fifteen days. By the proper use of refrigerants, however, she recovered, and at the end of two months, was safely delivered of a healthy child.*

In another case recorded by Murray, while it was successful in producing an abortion, it destroyed the life of the mother.† Professor Christison relates, on the authority of Mr. Cockson, the case of a girl, who, to produce abortion, took a strong infusion of savine leaves. Violent pain in the abdomen, and distressing strangury ensued. In two days after taking it, she miscarried; and in four after that, she died. On dissection, Mr. Cockson found extensive peritoneal inflammation—the inside of the stomach of a red tint, checkered with patches of florid extravasation. The uterus presented all the signs of recent delivery.‡

Mercury. This has long been considered as an article capable of occasioning abortion. Crude quicksilver was at one time supposed to possess this property. It was accordingly used, not merely for this purpose, but also in all cases of difficult labor. It was not long, however, before it was ascertained that large quantities of it might be taken by pregnant women with perfect impunity. Matthiolus relates of several pregnant women, each of whom drank a pound of quicksilver to cause abortion, without any bad effect.§ The same fact is confirmed by Fernelius.‖ *Calomel*, however, is the preparation of mercury most generally supposed to exert a specific influence upon the uterine organs. That it possesses the power of producing miscarriage, is countenanced by the authority

* Foderé, vol. 4, p. 431.

† Apparatus Medicaminum, vol. 1, p. 59. Dict. Mat. Méd. vol. 3, p. 696.

‡ Treatise on Poisons, p. 531-2. Second edition.

§ James' Dispensatory.

‖ Vidi mulieres qui libras ejus biberunt ut abortum facerent, et sine noxa. (Fernelius.)

of Mr. Burns, who directs that a full course of mercury should be avoided during pregnancy.* Facts, however, both numerous and conclusive, are on record to prove, that a pregnant woman may go through a long course of mercury, without the least injury either to herself or to the child. Bartholin and Mauriceau relate several cases, in which mercury was given to salivation, to pregnant women affected with syphilis, and who all, at their full time, were safely delivered of healthy children.† Mr. Benjamin Bell, than whom I could not quote higher authority, says, "It is a prevailing opinion, that mercury is apt to occasion abortion, and it is therefore seldom given during pregnancy. Much experience, however," he adds, "has convinced me that this opinion is *not* well founded, and when managed with caution, that it may be given in sufficient quantities at every period of pregnancy, for curing every symptom of syphilis, and *without doing the least injury either to the mother or child.*"‡ To the same effect is the testimony of Dr. Rush concerning the use of calomel in the yellow fever of 1793. In not a single instance did it prove injurious to pregnant women.§ The following case which fell under my own care, confirmed me in the opinion already advanced. A female, eight months gone with child, was attacked with a violent inflammation of the lungs. After the use of the ordinary depleting remedies, I found it advisable to have recourse to mercury. She was accordingly put upon the use of small doses of calomel and James' powder. In a few days, salivation came on; after which, all the symptoms of her pulmonary complaint speedily vanished, and the patient was restored to her usual health. She was afterwards delivered of a living child at the full period.

Dr. Campbell states that he was once asked to visit a young girl, whom he found so violently salivated, with a view to excite abortion, that her tongue could be compared to nothing else than a honey-comb. But notwithstanding her extreme suffering, she went to the full time.‖ At the same time there

* Midwifery, pp. 231, 233.

† Foderé, vol. 4, p. 429.

‡ Bell on the Venereal, vol. 2, p. 265. American edition.

§ Medical Observations and Inquiries, vol. 3. pp. 249, 309.

‖ Introduction to the Study and Practice of Midwifery. By Wm. Campbell, M. D. p. 142.

can be no question that the preparations of mercury, if given to patients *predisposed to abortion*, and especially if carried so far as to produce salivation, may be followed by that result.

Polygala seneka. This article has now been known and used in this country for a number of years, for the purpose of acting on the uterine organs, with the view of restoring menstrual secretion. The first notice which I have met with, of its properties in this respect, is in an inaugural dissertation by Dr. Thomas Massie of Virginia, published in 1803. By him the action of it on the uterus is specially noticed; and the authority of Dr. Archer of Maryland is given, of its being used by the common people in that state, for the purpose of procuring abortion.* That it may possess some power as an abortive, may be inferred from its acknowledged power as an emmenagogue.†

Pennyroyal. This article is reputed by some to be a powerful abortive. Dr. Watkins relates a case, in which the mere odour of it produced abortion in a delicate woman in the fourth month.‡ At the Chelmsford assizes, August 1820, Robin Collins was indicted for administering steel filings and pennyroyal water to a woman, with the intent to procure abortion. He was convicted, and sentenced to transportation for fourteen years.§

Besides the foregoing articles, belonging to the class of emmenagogues, there are others which are entitled to a place under the class of abortive agents.

Secale cornutum—spurred rye—ergot. This article, at present so fashionable in obstetric practice, was first announced to the profession in this country in the year 1807, by Dr. John Stearns of New-York, as a substance capable of accelerating, in an extraordinary manner, the process of parturition. As might naturally be expected from the announcement of a remedy so novel and unique, it excited much interest, and as soon as subsequent experience had confirmed its virtues, rose

* Medical Theses. By *Charles Caldwell*, M.D. Vol. 2, p. 203.

† See paper of Dr. Hartshorne in Eclectic Repertory, vol. 2, p. 201.

‡ Coxe's Medical Museum, vol. 2, p. 431.

§ Paris and Fonblanque, vol. 3, p. 83.

at once into the most unlimited popularity. In the year 1812, it was suggested by the editors of the New-England Journal of Medicine and Surgery, that while fully convinced of the parturient powers of the ergot, they were apprehensive that an evil of great magnitude not unfrequently resulted from its use; and that was, the death of the child. They stated that they had been led to this apprehension, from "observing that in a large proportion of cases where the ergot was employed, the children did not respire for an unusual length of time after the birth, and in several cases the children were irrecoverably dead."* The observations of numbers of highly respectable physicians since that period, have tended but too strikingly to confirm this melancholy fact. At present, it will scarcely be denied by any one acquainted with the operation of ergot, that if given in very large doses, or at improper periods, it will but too certainly prove detrimental to the life of the child.† It is to be feared, that for this purpose it has been but too frequently used in this country. It cannot, therefore, be too strongly insisted upon, that the life of the mother is equally jeopardized with that of the child, by its improper use. By some it has been doubted whether the ergot is capable of producing an abortion, or whether its action is limited to the full period of utero-gestation, and when the uterus is beginning to act itself for the purpose of unloading its contents. That it does possess the power of causing abortion at any period, would seem to be proved by experiments made upon animals;‡ and Dr. Chatard records a case of abortion induced in the human female subject at the fourth month of pregnancy, by twelve grains of ergot.§ Notwithstanding all this, it is a fact that ergot is no more infallible as an abortive, than any of the agents already noticed. Dr. Condie states that several instances have come to his knowledge, in which the ergot was employed to the

* Vol. 1, p. 70.

† For testimony on this point, I refer to the following authorities: New-York Medical Repository, vol. 12, p. 344; vol. 20, p. 11; vol. 21, pp. 23, 139. New-England Journal of Medicine and Surgery, vol. 1, p. 70; vol. 2, p. 353; vol. 5, p. 161; vol. 7, p. 216; vol. 8, p. 121. New-York Medical and Physical Journal, vol. 1, pp. 205, 278; vol. 2, p. 30.

‡ Philadelphia Journal of Medical and Physical Sciences, vol. 11, pp. 112–13.

§ New-York Medical Repository, vol. 21, p. 16.

extent of several drachms a day, for the express purpose of inducing abortion, but without exerting the least effect upon the uterus. In all these cases, gestation continued for the full period, and the females were delivered of living children. He also states that he has known the ergot to be given in large and repeated doses, by ignorant midwives, where pains simulating those of parturition have occurred towards the termination of utero-gestation, in order to quicken the labour; but so far from doing this, the pains have actually ceased under its use, and labour has not occurred for several weeks subsequently.* I have myself met with one case in which a female who had had several children, took of her own accord three drachms of ergot to produce an abortion, without any effect.

Actæa racemosa. The common name of this plant is the *black cohosh*, or the *squaw root*. It is a common plant, found in every part of the United States, and the root of it is a good deal used by some of our American practitioners. Recently it has been brought into notice as an article possessing powers analogous to those of the ergot. By our native Indians, it appears to have been long supposed to possess properties of this sort, and Mr. Rafinesque states that it is "much used by them in facilitating parturition, whence its name—squaw root." Dr. Tully, in a paper on this subject, has recorded the testimony of a number of respectable physicians, who have used this article for this purpose; and, as they state, with decided success, acting very much in the same way as the ergot. A fluid drachm of the saturated alcoholic tincture acted as a sufficient dose, without being repeated.† According to Dr. Tully, the actæa does not appear to exert the same stupefying and deleterious influence on the fœtus, that he supposes is produced by the ergot.

Digitalis. Of the effect of this active drug upon the uterine system, the following case is related by Dr. Campbell. "A married female, aged 26, fair complexion, relaxed, delicate habits, but not spare, the mother of several children, had ascites in her former confinement, and applied for the same

* American Journal of Medical Sciences, vol. 10, p. 227.

† Actæa racemosa. By William Tully, M. D. Professor of Materia Medica, in Yale College, in the Boston Medical and Surgical Journal for April 10, 1833.

complaint, when in the eighth month of this, her fourth pregnancy. In the course of twelve days, she took six drachms of the tincture of digitalis. On the twelfth day, at two A. M., the fœtus still born, was thrown off before assistance could be afforded to her; and in twelve hours and a half afterwards, the woman herself expired, although she was in the most favorable state when left after her delivery. The child seemed to have been but a very short time dead, for it exhibited no evidences of putrefaction. The body was examined twenty-five hours after death; it was running rapidly into putrefaction. About three pounds of water were contained in the chest; in the pericardium were found a few ounces of serosanguineous fluid; in the abdomen, the effusion was very trifling."*

Among the *local means* used for procuring abortion there are only two which require to be noticed—

Blows and other injuries on the loins and abdomen. In cases where severe blows have been received on the back, the danger of abortion is always imminent. It is, indeed, rare that a female goes to her full time when she has received such an injury. Blows on the abdomen are equally dangerous; and in most cases of this kind, a considerable hæmorrhage precedes the death of the fœtus. In disputed cases, where it is denied that the injury inflicted has caused the abortion, we should attend to the two following circumstances: First, whether the violence offered was sufficiently great to be considered as the sole cause; and second, whether the female was not predisposed to abortion, and had failed in some precautions, or committed some imprudence, which might have induced it. After investigating these facts, we ought to inquire whether the accused knew of the pregnancy of the female, or whether she had not provoked the blows which she received. Two cases from Belloc may serve to illustrate these distinctions. A young woman, between the third and fourth months of her pregnancy, had received, from a robust man, several kicks and blows with the fist, the marks of which were very evident. Immediately

* Introduction to the Study and Practice of Midwifery, p. 141.

after the accident, she was put to bed, bled, and various remedies given her by a surgeon. The hæmorrhage, however, continued, with pains in the loins and abdomen, and on the next day she had an abortion. Belloc, on being examined, declared that the accident was owing to the violence which had been inflicted.* In another case, a female brought forth a dead fœtus, four months advanced, two days after a quarrel with her husband, in which she said he had struck her. Instead, however, of lying down, or at least keeping quiet, she walked a league that day, and on the next a quarter of a league, to a place where she was to aid in bringing in the harvest; nor was it until her arrival there, that she was forced to go to bed. In this case, Belloc decides that it is very possible, had she remained quiet, and called for proper aid, the abortion would not have taken place, particularly as the violence used was only that of throwing her down in the street.†

With regard to this cause of abortion, as well as the others that have been mentioned, it is to be understood that the life of the *mother* is equally exposed with that of the child. The following case, related by Dr. Smith, illustrates this fact in a striking manner, and is only one of a number which might be adduced. In 1811, a man was executed at Stafford for the murder of his wife. She was in the pregnant state, and he had attempted to induce abortion in the most violent manner, as by elbowing her in bed, rolling over her, &c.; in which he succeeded—not only procuring abortion, but along with it the death of the unfortunate woman.‡

By Dr. Campbell, a case is recorded of a female, who, in the last month of pregnancy, was struck on the abdomen by her husband. An extensive detachment of the placenta caused the immediate death of the fœtus, and that of the mother in fifty-one hours afterwards.§

The introduction of an instrument into the uterus for the purpose of rupturing the membranes, and thus bringing on premature action of the womb. Of this villainous practice, which has

* Belloc, p. 81.

† Cours de Médecine Légale, par J. J. Belloc. p. 82.

‡ Smith's Forensic Medicine, p. 305.

§ Introduction to the Study and Practice of Midwifery, &c. p 137.

long been known and resorted to for the nefarious purpose of producing abortion, I shall say nothing more than to give the history of a few cases in which it was used, and which will show the effects with which it is attended. "At Durham assizes, in 1781, Margaret Tinckler was indicted for the murder of Janet Parkinson, by inserting pieces of wood into her womb. The deceased took her bed on the second of July, and from that period thought she must die, making use of various expressions to that effect. She died on the 23d. During her illness, she declared that she was with child by a married man; and he, being fearful, should she be brought to bed, that the knowledge of the circumstance would reach his wife, advised her to go to the prisoner, who was a midwife, to take her advice how to get rid of the child—being at the time five or six months gone. The delivery took place on the 10th of July, three days previous to which, a person saw the deceased in the prisoner's bed-chamber, when the prisoner took her round the waist, and shook her in a violent manner five or six different times, and tossed her up and down. She was afterwards delivered at the prisoner's house. The child was born alive, but died instantly, and it was proved by surgeons to be perfect. There was no doubt but that the deceased had died by the acceleration of the birth of the child; and upon opening the womb of the mother, it appeared that there were two holes caused by wooden skewers, one of which was mortified and the other inflamed. Additional symptoms of injury were also discovered."*

In England a very curious trial took place in 1808, of two persons, William Pizzy and Mary Codd, "for feloniously administering a certain noxious and destructive substance to Ann Cheney, with intent to produce a miscarriage." On the trial, it appeared that they had given medicines several times to produce the abortion without any effect. In consequence of this failure, Pizzy, who was a farrier, introduced an instrument into the vagina, and in that way destroyed the child and brought on premature delivery. This took place about six or seven weeks before the full time. Although the facts appear-

* East's Crown Law, vol. 1, p. 354. Smith, p. 306.

ed very clear on the trial, yet the jury brought in a verdict of acquittal.*

By Foderé and Ristelheuber a case is related, in which rupture of the uterus and death was occasioned by the introduction of a syringe with a long ivory pipe, for the purpose of producing abortion. On dissection, a fœtus of about two months was discovered in the abdomen.†

By Dr. Baxter, of New-York, another case is recorded, in which he was called to a female who had employed a person to procure an abortion by the introduction of a silver catheter. The only effect however, was that of wounding the os tincæ, and rupturing the membranes without expelling the fœtus. Fifteen days after the perpetration of the deed, Dr. Baxter found her in terrible pains, and having bled her twice without relief, he gave her ergot, to facilitate the delivery of the fœtus, which very shortly brought it away. It was perfect, and about four months old. Unfortunately, the names of the persons concerned in this infamous transaction, were never divulged.‡

On this subject, the following interesting and instructive fact is related by Dr. Gooch. "Dr. William Hunter, attempted this operation (introducing an instrument to puncture the membranes) on a young woman, at about the third month of pregnancy. He found that he several times punctured the cervix uteri, and the case terminated fatally. If this happened to one of so much anatomical knowledge and skill, how much more probable must it be in the hands of those ignorant men, by whom, for the purpose alluded to, the operation is sometimes undertaken! No doubt these attempts often prove fatal, but the murdered do not tell tales."§

A most extraordinary mode of causing abortion recently occurred in France, which may perhaps be appropriately noticed in this place. The subject, was a married woman, who had four children, and was pregnant of a fifth. At the commencement of her pregnancy, she was persuaded by the re-

* Edinburgh Medical and Surgical Journal, vol. 6, p. 244.

† Medico-Chirurg. Review, vol. 6, p. 528.

‡ The Medical Recorder, vol. 8, p. 461, for 1825.

§ A Practical Compendium of Midwifery, by Robert Gooch, M. D. p. 94. Am. Ed.

presentations of another female, to inject sulphuric acid into the vagina as an easy mode of inducing premature labour. As may readily be imagined, excessive inflammation of the parts took place, together with great general constitutional disturbance, and the final result was an almost complete obliteration of the vagina. "The medical men on examination, found that a kind of irregular band surrounded and obstructed the vagina, beyond which, and on the brim of the pelvis, the head of the infant was distinctly felt, pressed forward by the uterine contractions. It was resolved to make an incision through the dense membrane, but when this was done, it was found it had adhered to the bladder, which the incision had completely divided. The delivery was not at all facilitated, and the attendants felt themselves compelled to perform the cæsarean operation. The infant was extracted dead, apparently for some time, and the mother immediately expired."†

Having thus finished the notice which I proposed to take of the methods which have been resorted to for criminally producing abortion, I must again insist upon a circumstance, already adverted to, but which cannot be too often repeated; and this is, the danger which necessarily attends the life of the mother in every attempt of this sort. Even in cases where miscarriage results from involuntary causes, and where every prudential measure has been adopted for obviating its consequences, it is well known that the mother frequently falls a victim. How much more likely is this to be the result when the miscarriage is occasioned by great and unnatural violence done to the system, and that too under circumstances which generally shut out the wretched sufferer from the benefit of all medical succour. Velpeau states that he had a female under his care, who produced a violent abdominal inflammation by taking medicines to promote abortion. She died on the eighth day, without any symptoms of abortion having appeared.‡ There is another circumstance also of great importance, which should not be forgotten. It has happened in some instances, that while the mother has lost her life in attempting

† The Lancet, vol 8, p. 38.

‡ Meigs' Velpeau, p. 233.

to procure a miscarriage, the child has actually been born alive and survived. A case of this kind was witnessed by Foderé in 1791. A cook finding herself pregnant, and not being longer able to conceal it, obtained half an ounce of powdered cantharides, and mixed it with an ounce of sulphate of magnesia, and took them down in order to produce abortion. Some hours after, she was seized with violent cholic, and brought forth a *living child*, in the most horrible pains. During the succeeding night she died.* If these facts were more generally known, I suspect the attempts at abortion would be much less frequent than they are at present. With regard to the accessaries and accomplices in this crime, it would be well for them to remember, that in every experiment of this kind which they make, they take upon themselves the awful responsibility of jeopardizing not merely a single life, but two lives. As far as *intention* is concerned, they are in all cases as much chargeable with the death of the mother, as with the destruction of the fruit of the womb.

It results, therefore, from what has been said, concerning the means of producing abortion,

1. That all of them are *uncertain* in their operation upon the fœtus.

2. That they always endanger the life of the mother, and

3. That they sometimes destroy the mother without affecting the fœtus.

I deem it so important to enforce these results, that I shall confirm them by the following authorities. "It is evident, I believe from experience," says Farr, "that such things, (abortives,) cannot act as efficient causes, without the aid of those predisposing causes, or natural habits of the body, which are necessary to concur with them. As attempts of this kind, however, should not be passed off with impunity, and *as the life of the mother as well as the child* is endangered by such exhibitions, if advised by any other, they should be considered as highly culpable, and for this reason should be made known."†

* Foderé, vol. 4, p. 436.

† Farr's Elements of Medical Jurisprudence, p. 70.

"Every woman," says Bartley, "who attemps to promote abortion, *does it at the hazard of her life.* It may be remarked, whoever endeavors to counteract the ordinary proceeding of nature, will have in the end sufficient cause to repent the temerity.*"

"There is no drug," says Male, "which will produce miscarriage in women not predisposed to it, *without acting violently on their system, and probably endangering their lives.*"†

Smith says, "Abortion is in general injurious to health, and is seldom unaccompanied with suffering. The administration of emmenagogues to force a separation of the ovum, where the constitution has no tendency to throw it off, *is highly dangerous to the mother.* No drugs can act in this way upon the uterus, but by involving it in a violent shock given to the general system. *It has frequently occurred, that the unhappy mother has herself been the sacrifice, while the object intended has not been accomplished.*"‡

Burns says, "It cannot be too generally known, that when these medicines do produce abortion, the mother can seldom survive their effect."§

To show how difficult the perpetration of abortion sometimes is, the following case will serve as an illustration. "A young woman, seven months gone with child, had employed savine and other drugs, with a view to produce a miscarriage. As these had not the desired effect, a strong leather strap (the thong of a skate) was tightly bound round her body. This too availing nothing, her paramour (according to his own confession) knelt upon her, and compressed the abdomen with all his strength; yet neither did this effect the desired object. The man now trampled on the girl's person while she lay on her back; and as this also failed, he took a sharp pointed pair of scissors, and proceeded to perforate the uterus through the vagina; much pain and hæmorrhage ensued, but did not last long. The woman's health did not suffer in the least, and pretty much about the regular time, a living child was brought

* Bartley's Treatise on Forensic Medicine, p. 5.

† Male's Epitome of Juridical Medicine, in Cooper's Tracts, p. 203.

‡ Smith's Principal of Forensic Medicine, p. 295.

§ Principles of Midwifery, p. 283.

into the world, without any marks of external injury upon it. It died indeed four days afterwards, but its death could not be traced to the violence inflicted on the mother's person; all the internal organs appeared normal and healthy."*

Velpeau makes the following statement in relation to the consequences of using instruments to procure abortion.—"Those who make use of them most frequently, fail of attaining their object, and succeed only in seriously injuring the womb. I once prescribed for a female, in whom such attempts had brought on a flooding which conducted her to the verge of the grave; she suffered horribly from pain in the interior of the pelvis for two months, notwithstanding which, abortion did not take place, and she is now a prey to a large ulcer of the neck of the womb. I opened the body of an unhappy creature who suffered from the like attempts, which did not succeed any better than the one above mentioned. M. Girard, of Lyons, mentions a similar instance. Very recently, also, (Oct. 1828,) a young woman who became pregnant against her wishes, succeeded by such manœuvres only in producing an organic lesion of the uterus, which, after frightful sufferings, led her to the commission of suicide."†

Of the involuntary causes of abortion. Of these it is not necessary to say much. They should always, however, be kept in view in medico-legal investigations on this subject, so that we may not attribute to criminal interference what is owing to some morbid derangement. Diseases of various kinds, as rheumatism, pleurisy, small pox, typhus and yellow fevers, scarlatina, syphilis, and measles, operating on a system predisposed by nervous irritability—a diseased state of the uterus—the intemperate use of spirituous liquors—irritation of the neighboring organs, from costiveness, tenesmus of dysentery, hæmorrhoids, prolapsus ani, diarrhœa, incontinence of urine—errors in regimen and diet—violent exercise, as in walking, dancing, riding, running, &c—accidental falls—a sudden contortion or shock‡ of the body—indulgence of any violent pas-

* Professor Wagner, in the London Medical Quarterly Review, vol. 2, p. 437.

† Meigs' Velpeau, p. 238.

‡ The pulling of a tooth, for instance, has been known to produce abortion. Burns on Abortion, p. 64.

sion of the mind, whether joyful or sad—the relation of any unexpected intelligence—a great noise*—the appearance of any extraordinary object—previous abortion—fluor albus—excessive venery—accidental blows on the abdomen—the death of the fœtus—the attachment of the placenta over the os uteri—retroversion of the womb—hæmorrhage, from whatever source, or at any period†—all or any of these causes may give rise to abortion, without the imputation of the least criminality to the female.

The influence of the passions upon the uterine functions is peculiarly striking. It is an extraordinary fact, that the melancholy and sadness caused by some great evil which is known and expected, are much less injurious to a pregnant woman, than the annunciation of some important good, or even a trifling misfortune which is unexpected. Foderé relates the case of some pregnant women, who, during the horrors of the French revolution, were confined in dungeons, and condemned to death; their execution was, however, delayed in consequence of the peculiarity of their situation. Yet notwithstanding the actual wretchedness of their condition, and the more terrible anticipation of future suffering, they went on to the full time, during which period, a fortunate change in the state of parties rescued them from unmerited punishment.‡

Circumstantial evidence. In concluding the subject of abortion, I shall make a remark or two upon the circumstantial evidence which may be adduced to prove the guilt of the accused. With regard to *concealing her pregnancy*, I cannot

* A case, in which a *great noise* as a cause of miscarriage was involved, was tried in 1809, at the quarter sessions of Franklin county, in Pennsylvania. The indictment charged that Taylor, (the defendant) unlawfully, *secretly*, and maliciously, with force and arms, broke and entered at night the dwelling-house of James Strain, with intent to disturb the peace of the commonwealth; and after entering the house, unlawfully, wilfully and turbulently, *made a great noise*, in disturbance of the peace of the commonwealth, and did greatly misbehave in said dwelling-house, and did greatly frighten and alarm the wife of the said Strain, whereby she *miscarried*, &c. The offence was held indictable as a *misdemeanor*. The jury found the defendant guilty; but the quarter sessions arrested the judgment upon the ground, that the offence charged was not indictable. The supreme court decided in this case, that the judgment should be reversed, and the quarter sessions were directed to proceed to give judgment against the defendant. Binney's Reports, vol, 5, p. 277.

† Burton's Midwifery, p. 261. Burns' Midwifery, p. 161. Burns on Abortion. Hamilton's Midwifery.

‡ Foderé, vol. 4, p. 422.

conceive with what justice any inference can be drawn prejudicial to her character. If her pregnancy be the result of illicit commerce, it is perfectly natural that she should make use of every effort to conceal her disgrace as long as possible. The mere fact of concealment, even if proved, ought to be considered as no evidence whatever of her guilt.

If she has been known to apply frequently to the same or to different physicians to be bled, especially in the foot; if she has endeavoured to procure any of the medicines usually given to produce this effect; if any are found in her possession, or if she can be convicted of actually taking them without medical advice, we have then the strongest circumstantial evidence which the nature of the case admits of, to pronounce her *intention* to have been criminal. These are circumstances, however, which do not strictly come under the cognizance of the professional witness; they are matters of fact, which must be decided upon from the testimony which may be offered by the other witnesses cited to appear in the case.

2. *Of the murder of the child after it is born, with an account of its various proofs and modes of perpetration.*

In every case in which an infant is found dead, and becomes the subject of judicial investigation, the great questions which present themselves for inquiry, are,

1. Has the child attained that size and maturity which would enable it to maintain an independent existence?

2. Was the child born alive?

3. If born alive, by what means did it come to its death?

Having come to the conclusion that the death of the child is owing to violence, it is next to be ascertained who the perpetrator of it is. Should suspicion light upon a female as being the mother of it, the questions to be determined concerning her, are,

1. Whether she has been delivered of a child? And,

2. Whether the signs of delivery correspond as to time, &c. with the appearances observed on the child?

These are the only points upon which the *professional witness* can be called to give his testimony, and to the consideration of these I shall accordingly confine myself.

1. *Proofs of a child's having attained a sufficient maturity to maintain an independent existence.* Although children born before the completion of the seventh month have occasionally survived, and been reared, yet in a medico-legal point of view, no child ought to be considered as capable of sustaining an independent existence until the seventh month has been fully completed. Accordingly, if it can be proved that the child which is the subject of investigation has not attained this age, no charge of infanticide can or ought to be entertained. Even when the full term of seven months has been attained, its chances of surviving are exceedingly uncertain; and just in proportion as the child approaches the full term, is the probability of its living increased. The principal signs by which a judgment is to be formed in these cases are, the *weight of the child—its length*—and the *relative situation of the cen- of the body.* These have already been noticed in a previous part of this essay, and require no additional comment.*

2. *Proofs of the child having been born alive.* We know nothing of the *nature* of *life;* we judge of it only from its effects, and declare that being as enjoying it, who performs the functions considered essential to it. These functions are called *vital,* and are usually enumerated as the three following, viz: the *cerebral* and *nervous;* the *sanguineous* and the *respiratory.* This distribution can only apply, however, to the state after birth: in the fœtal state, facts would seem to prove, that nothing besides the *circulation* of the blood is necessary to the maintenance of the vital principle. Even the energy of the brain, which is afterwards to determine the character, and in a great measure to fix the destiny of the being it inhabits, is originally dormant, and the organ itself occasionally wanting. In cases of infanticide, it is only from the *circulation* and *respiration* that any thing is to be learned: the *brain* and *nerves* leave no trace of their influence behind them.

Proofs of the blood having circulated after birth. There are four things in connection with this, that require investigation, viz. *the character of the blood itself; the state of the heart and vessels circulating the blood; the distribution of the blood in the*

* See page 45.

different organs of the body; and the existence of ecchymoses and extravasations.

(*a.*) *Of the character of the blood itself.* By some eminent authorities, it is asserted that there is no difference in appearance between the arterial and venous blood of the fœtus. Biehat investigated this point particularly, and he states that he made numerous dissections of young guinea pigs while yet in the womb of their mother, and he uniformly found the blood of the arteries and veins presenting the same appearance, resembling the venous blood of the adult. Not the slightest difference was observed between the blood taken from the aorta, and that from the vena cava, nor between that drawn from the carotid artery and the jugular vein. He made the same observations in three experiments of a similar nature upon the fœtuses of dogs. He also frequently dissected human fœtuses who died in the womb, and found the same uniformity in the arterial and venous blood. From these facts, he concludes, that no difference exists between the arterial and venous blood of the fœtus, at least in external appearance.* Velpeau and Autenreith, as the result of their experiments and observations, confirm this statement.† By other observers this is positively contradicted; and it is asserted, that the difference between the blood of the arteries and veins is very obvious.‡ By Dr. Jeffrey, the following experiment was made. He took part of the umbilical cord and dissected away the gelatinous part of it, until he had laid bare the vessels, when on puncturing them, he found there was a difference between the blood in the vein and the arteries.§ A simpler mode of performing this experiment, suggested by Mr. Carr of Sheffield, is the following. As soon as the child is born and the cord divided, take the placental portion of it, around the end of which a ligature has been previously applied, and cut it two or three inches from the ligature with a sharp scalpel, so as to make an even surface. If the portion

* Bichat's General Anatomy. Translated by Hayward, vol. 1. p. 355.

† Velpeau's Midwifery, p. 219.

‡ Bostock's Physiology, vol. 2, p. 157. American edition.

§ The Physiology of the Fœtus, Liver and Spleen, by George C. Holland, M. D. p. 154.

of cord be now pressed from below upwards, the blood flowing from the vein and that from the arteries will be found very different. "Sometimes a large drop of florid blood is observed to stand directly over the umbilical vein, and another dark colored over the arteries, without their being in the least mingled with each other, and in this case, the difference between the two is so striking that no one can fail to observe it."* In relation to this experiment, it is to be remarked, that to render it of any force in controverting the observations of Bichat, it ought to be made upon the *still born* child, in whom respiration has never taken place. Performed upon the child which has been born alive and breathed, the difference between the arterial and venous blood is just what might have been expected.

Of its coagulation. By some it has been supposed that the blood of the fœtus does not coagulate. This, however, is a mistake. But although the fœtal blood does coagulate like adult blood, yet there is this difference between them, that the coagulation of the former is by no means so firm and solid as that of the latter. This was originally observed by Fourcroy,† and has since been confirmed by other observers.

The effect of exposing the fœtal blood to the action of the atmosphere. In the experiments made by Fourcroy, the coagulum, of a brown red, exposed to the atmosphere, did not become florid in the same manner as that of the adult. There were, however, filaments of a red colour running over the brown mass,‡ giving it a veined appearance. By others, this is controverted; and Dr. Blundell states that it can easily be proved that the blood of the fœtus does become florid, by taking it from the umbilical vessels, and setting it aside, exposed in a cup to the action of the atmosphere. In a very short time, he says, it will be found to undergo a change to a bright red color; and if the clot be cut vertically in two,§ the contrast between the exposed and unexposed parts will be very striking. Here too the same remark is applicable, that

* Physiology of the Fœtus, &c. by George C. Holland, M. D. p. 154.
† Annales de Chimie, tome 7, p. 162.
‡ Annales de Chimie, tome 7, p. 163.
§ Blundell, in Lancet, for 1828, p. 130.

was made in relation to the experiments of Drs. Jeffrey and Carr. The blood which is exposed ought to be that of the fœtus which has not respired. The blood taken from the umbilical vessels in ordinary cases of delivery, where the child is born alive, and has breathed, is not fœtal blood. Whether this precaution was observed by Dr. Blundell, does not appear from his statement.

Chemical composition of fœtal blood. On this subject, I believe we have nothing but the analysis of Fourcroy. As the result of this, there would seem to be a real difference between the composition of fœtal and adult blood. According to him, the points of difference are the following:—1. In the fœtus the coloring matter is darker, and the blood is not so susceptible of taking the brilliant red shade, on exposure to the atmosphere. 2. It contains no fibrous matter; the thickened and coagulated matter which is found in its place, resembles more gelatinous matter. 3. It does not contain any phosphoric acid.*

According to the observations of Fourcroy, Tiedemann and others, it would appear, also, that the proportion of serum in fœtal blood is much larger than in adult blood.†

In addition to the foregoing, the miseroscopical observations of MM. Prevost and Dumas, have ascertained that the red globules of the blood in the fœtus differ in their form and volume from those of the adult, the former being much smaller than the latter.‡

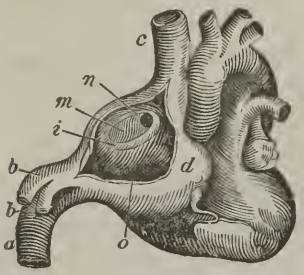
The foregoing facts and observations, although they go to show that there are some interesting points of difference between the blood of the fœtus and that of the adult, are yet, I fear, of too delicate a nature to be rendered practically available in a question of so grave import as that of infanticide.

(*b.*) *The condition of the heart and bloodvessels.* Without going into any elaborate description of the circulation in the fœtal state, it is only necessary to state that there are a number of striking and interesting peculiarities in the organs circulating the blood in the fœtus, which are modified or entirely lost after

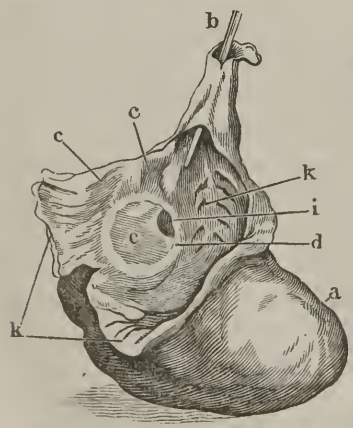
* Annales de Chimie, tome 7, p. 165.
† Velpeau's Midwifery, p. 218.
‡ Velpeau's Midwifery, p. 219. Bostock's Physiology, vol. 2, p. 158. Am. ed.

the child is born, and respiration is established. These peculiarities, therefore, require to be specially noticed. They are the *foramen ovale;* the *ductus arteriosus;* the *ductus venosus;* the *umbilical vessels*, and the *cord.*

The *foramen ovale.* This is an opening situated in the septum which divides the right auricle from the left, and through it part of the blood is conveyed directly from the right to the left auricle. It is nearly equal in size to the mouth of the inferior cava, and is supplied with a thin transparent falciform valve, situated on the side of the left auricle. In this way the valve permits the flow of blood into the left auricle, but prevents its return into the right auricle. When the valve is closed, there is generally a small aperture still left open, where the valve falls slack, and is ready to open. The accompanying sketches will render more intelligible the relative situation and appearance of the foramen ovale.



a. The ascending cava, with its hepatic branches, *b b.*
c. The descending cava.
d. The right auricle, where it lies against the roots of the aorta and the pulmonary artery.
i. The circle which surrounds the foramen ovale, sometimes called the *isthmus vieussenii*, but more commonly the *circulus foraminis ovalis.*
m. The valve of the foramen ovale.
n. The aperture or opening in the foramen ovale.
o. The opening towards the ventricle.



This sketch is intended to show the foramen ovale still more plainly. Every portion of the fœtal heart is cut away, except the ventricles and the partition between the aurieles.

a. The ventricles.
b. The vena cava, with a blowpipe in it.
e e. The septum between the auricles laid open to display the foramen ovale.
k k. The musculi pectinati, or muscular fibres of the auricle.
d. The circulus foraminis ovalis.
e. The valve of the foramen ovale.
i. The aperture of the valve, where the valve falls slack and opens.

After birth, the foramen becomes obliterated by the closure and adhesion of the valve, and leaves behind it in the adult nothing but an oval depression in the septum between the auricles. This depression is called the *fossa ovalis*, and corresponds to the space occupied in the fœtus by the foramen ovale.* In the fœtal state, and anterior to respiration, this foramen is always open; and it becomes closed only in consequence of the blood taking a new route through the lungs, when respiration commences. If, therefore, in examining any case, the foramen ovale be found closed, it is a very decisive evidence of the child's having been born alive. It is to be recollected, however, that this closing and obliteration of the foramen ovale is a gradual process, taking sometimes from two to three weeks before it is completed. Hence it is obvious, that however strong a proof its closure may be of previous life, yet its being open is no evidence to the contrary. To render the phenomena connected with the foramen ovale available in these cases, it was suggested, originally I believe by Professor Bernt of Vienna, that although the complete closure of the foramen ovale did not take place until some days after birth, yet that during all this time it underwent certain changes, which would distinctly mark the period which had elapsed after the birth of the child. That the foramen ovale does undergo a series of changes during the process of obliteration, was remarked so early as 1750 by the English anatomist Ridley, and has since then been confirmed by the observations of anatomists and physiologists. These changes consist mainly in the position of the aperture of the foramen. In the fœtus anterior to respiration, the aperture of the foramen ovale is always found at the lowest part of the valve; as soon as respiration has commenced, it is gradually turned towards the right; after some weeks, it is elevated still higher; and finally, after revolving as it were around the right edge of the valve, it is found at the *upper*, instead of the *lower* side of it:† In

* Bell's Anatomy, vol. 1, p. 396. American edition. See also Meckel's Anatomy, vol. 2, p. 207. American edition, by Doane.

† "1. *In fœtu*, omnino non respirante, hiatus foraminis ovalis *ad imam partem valvulæ* reperitur, per quam sanguis e vena cava ascendente effusus, statim ad sinistrum ventriculum transjiciendus, transmigrat:

"2. *In infante recens nato, qui per paucula momenta respiratione usus est*, apertura

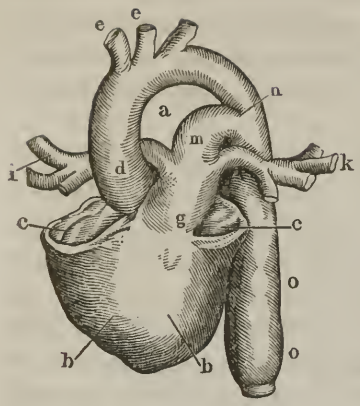
other words, as soon as respiration commences, the aperture of the foramen ovale moves gradually from the bottom to the top, and from left to right. Now these changes in the foramen ovale, according to Professor Bernt, will indicate not merely the existence of respiration, but also the different periods during which it has continued. With regard to the validity of this test, however, it must be obvious, that from the gradual manner in which these changes take place, a great many cases must occur in which they can furnish no decisive evidence. For instance, suppose a child had taken only one or two inspirations, sufficient to fill the lungs, and to show that it had actually been born alive, the change in the position of the foramen ovale would be so slight as to render it altogether inappreciable. Besides this, there is another consideration of great importance, which is, that from the very nature of these changes, no one would be competent to decide upon them, unless he had had the good fortune, which falls to the lot of very few, of making a great number of dissections and observations upon the fœtus. In the hands of the generality of physicians, it might lead to numerous and even unavoidable errors. In addition to all this, the very observations made by Bernt himself prove that the changes in the foramen ovale do not take place so uniformly and certainly, as to render it safe to draw any positive conclusion from them. On these various accounts, I must confess that I do not attach the same importance to this test as is done by Professor Bernt.

The *ductus arteriosus*. This is a vessel which passes directly from the pulmonary artery, and enters the aorta just below its arch. It is a vessel of considerable size, being somewhat larger than the aorta itself in the fœtus. It conveys a large portion of the blood sent into the trunk of the pulmonary artery, directly into the aorta.

istius foraminis e tramite suo pristino jam paululum *dextrorsum deflexa* conspicitur, inde sanguis e vena cava inferiori illuc appellens, cum sanguine e superiori vena cava refluo, per partem foraminis jam clausam novo incepto circuitu decurrit:

"3. *In infante plures septimanas nato*, apertura foraminis *adhuc altius* cum valvula *dextrorsum suspensa* deprehenditur:

"4. *In adulto*, demum foramen cum sua apertura et valvula plane *inversum* apparet, adeoque ejus apertura supra tuberculi Loweri marginem inferiorem penitus se recondit, cum valvula eadem transitu temporis, ni impedimentum intercurrat, firmiter adhæsura." (Experimentorum Decimasiam Pulmonum Hydrostaticam Illustrantium. Centuriæ i. Sectio ii. Curante Josepho Bernt. Prefatio, p. xii. Viennæ, 1824.)



b b. The ventricles of the heart.
c c. The places from which the auricles have been cut away.
d. The root of the aorta, with (e e) its branches.
g. The pulmonary artery.
i. The right branch of the pulmonary artery.
k. The left branch.
m. The *ductus arteriosus*, running from the pulmonary artery to the aorta, which it joins at n.
o o. The aorta, increased in size after the junction of the ductus arteriosus.

In this sketch, the ductus arteriosus is unnaturally separated from the aorta, by pulling it down, and thus leaving the space (a) between them.

In the fœtus, the ductus arteriosus will be found open and filled with blood. After birth, it becomes obliterated and the duct itself becomes eventually changed into a ligament.* If, therefore, in any case, this duct is found permanently closed, it is a positive proof that the child has been born alive, and enjoyed it for a longer or shorter period. As, however, its closure does not take place sometimes till two or three weeks after birth, its being found open is no proof that the child was born dead. By Professor Bernt, however, it is urged that, as in the foramen ovale, a succession of changes takes place which may sufficiently mark the various intervals which have elapsed between them and the birth of the child; and upon these he has founded another test in cases of infanticide, to which he attaches great value. According to Dr. Bernt, in the mature fœtus, before respiration, this duct is nearly half an inch long; its shape is cylindrical; its diameter is equal to that of the main trunk of the pulmonary artery, and more than double the capacity of the branches of that artery, each of which is equal to a crow quill.

If the child has respired only a few moments, the ductus ar-

* "In the adult, it is so thoroughly obliterated, that by the most careful dissection we can show no other vestige of it than a cordlike adhesion of the aorta and pulmonic artery." (Bell's Anatomy, vol. 1, p. 465, Am. ed.)

According to Meckel, the obliteration of the ductus arteriosus leaves behind it "a round solid cord, a line thick and about four lines long." (Meckel's Anatomy, vol. 2, p. 374. Translated by A. S. Doane, M. D.)

teriosus loses its cylindrical shape; the part towards the aorta becomes contracted, and the whole duct assumes the shape of a truncated cone, the base of which is towards the pulmonary artery, and the apex towards the aorta; sometimes the contrary of this observed.

If the child has lived for several hours, or for a day, it recovers its cylindrical shape, but is greatly diminished both in length and diameter. It is now not larger than a goose quill and not more than equal to one of the branches of the pulmonary artery. If it has lived for some days or a week, the duct will be found wrinkled and shortened to the length of only a few lines, while its diameter is not larger than that of a crow quill; at the same time the diameter of the branches of the pulmonary artery will be found increased to that of a goose quill. Finally, the perfect closure of the duct does not take place until after the lapse of several weeks or months.*

If, therefore, *the ductus arteriosus be found cylindrical in its shape, and not contracted towards the aorta, and if it equal in size the trunk of the pulmonary artery*, the inference would be, that the child was not born alive. On the other hand, if the *ductus arteriosus be contracted towards the aortal end, and if its size be much less than the trunk of the pulmonary artery*, the inference would be, that the child had been born alive.

With the view of testing the correctness of the observation of Bernt, some experiments were instituted by Orfila, and of the eight cases which he details, only four were found to confirm them.

In one case, of a mature still-born male fœtus, the ductus arteriosus was found only *half the size of the trunk of the pul-*

* "1. Si *paucula momenta* recens nati exstiterint, aortam descendentem versus sphæroides, paulo post mutata figura cylindracea, apparuit conus truncatus, basim cordi, apicem aortæ descendenti, aut contra, obvertens:

"2. Si *plures horas diemve* vitam retinuerint, denuo formam cylindraceam, ast longitudinem et latitudinem imminutam, diametrum caulis pennæ anserinæ, adeoque diametro trunci arteriarum pulmonalium longe minorem, et illi *arteriarum binarum pulmonalium* fere parem exhibuit:

"3. Si vitam *ad plures dies septimanamve* perduxerint, canalis jam rugosi longitudo ad lineas aliquot, crassities ad diametrum pennæ corvinæ coarctata, diameter vero *arteriarum pulmonalium* ad crassitudinem caulis pennæ anserinæ aucta conspicitur:

"4. Pœnitus autem occlusus ductus hic multo serius et incerto hebdomadum mensiumve numero deprehenditur." (Experimentorum Docimasiam Pulmonum, &c. Præfatio, p. xv. xvi.)

monary artery; it was cylindrical, half an inch long, and about as large as one of the branches of the pulmonary artery.

In a second case, of a male fœtus eight months old, born dead, the ductus arteriosus was found not quite *half the size of the trunk of the pulmonary artery;* larger than the right, and much larger than the left branch of that artery.

In a third case, of a mature female infant which had lived five hours, the ductus arteriosus, so far from being cylindrical, was found dilated at its middle part, and its extremity towards the aorta much larger than that towards the heart; it was eight lines in length, and considerably diminished in size. The trunk of the pulmonary artery was sensibly larger than the left branch of that artery, but scarcely equalled in size the right branch of this vessel.

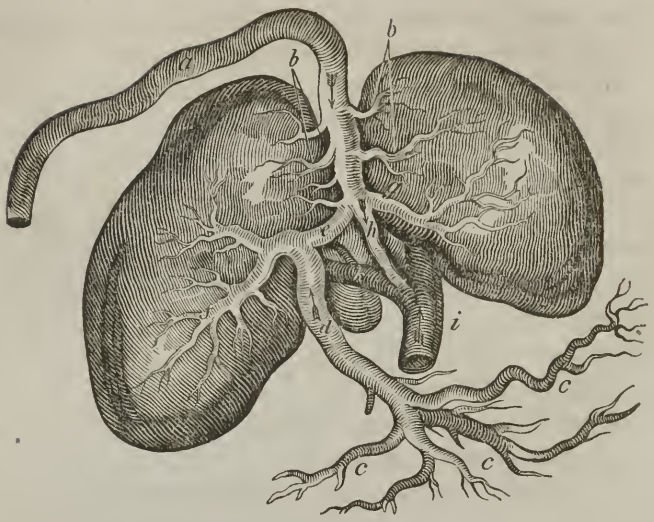
In the fourth case, a female infant of full age, having lived nineteen days, the ductus arteriosus was only three lines in length, cylindrical, its size three times less than that of the trunk of the pulmonary artery, a little less in size than the right branch, but much larger than the left branch of that artery.*

In four other cases of infants at full age, two of whom were born dead, it was found that the ductus arteriosus corresponded with the statements of Professor Bernt.

From the foregoing, therefore, it would seem, that however correct the observations of Bernt may be as a general rule, yet they are not to be considered as *invariably and universally so*—a fact continually to be borne in mind in their application to cases of infanticide.

The *ductus venosus.* This is a vessel lodged in the posterior part of the longitudinal fissure of the liver. It comes off directly from the umbilical vein, and opens with the venæ hepaticæ into the vena cava ascendens. It is large enough to admit a common sized probe, which can easily be introduced into it through the umbilical vein. Through this vessel, a portion of the blood passing through the umbilical vein, goes directly to the cava, and then to the heart.

* Leçons de Médecine Légale, par M. Orfila, vol. 1, p. 388-9. Second edition.



a. The umbilical vein.
b. Branches given off to the substance of the liver.
i. The vena cava ascendens.
h. The *ductus venosus.*
k k. The hepatic veins.
d. The vena portæ, formed by the junction of the abdominal veins *c c c.*
e. The cylinder of the vena portæ, being its great right branch where it lies in the transverse fissure.
f. The right branch of the vena portæ in the liver.

In the fœtus anterior to respiration, the ductus venosus is always found open, and containing blood. In the child which has respired for a certain length of time, on the contrary, it will be found collapsed, and empty of blood. The whole vessel, after a certain time, becomes impervious, and is finally converted into a ligament. The period at which this final change takes place, varies very much in different cases. In twenty infants who had lived three days, the ductus venosus was found empty and obliterated.* Generally speaking, this vessel is obliterated before the ductus arteriosus or the foramen ovale. The only inferences that can be drawn from the ductus venosus, are these: if it be obliterated, it is a proof that the child has lived and respired; on the contrary, as it remains open a day or two at least after birth, its being found open is no proof that the child was born dead.

* Leçons de Médecine Légale, par M. Orfila, vol. 1, p. 384. Second edition.

The umbilical vessels. These consist of two arteries and a vein. The former (the arteries) are nothing more than continuations of the iliac arteries. They mount up along the sides of the urinary bladder, and go directly to the umbilicus, through which they pass, forming with the vein, the umbilical cord. These are the *umbilical arteries*, and they carry the blood of the fœtus to the placenta. The latter (the *umbilical vein*,) carries the blood from the placenta to the fœtus. It enters the fœtus at the umbilicus, and goes upwards and backwards to the great fissure of the liver. After birth, these vessels become gradually obliterated, and converted into ligaments. The period at which this obliteration takes place, varies in different subjects. It takes place however, sooner than that of any other of the fœtal openings. In twenty cases of infants who died on the third day, they were in all found obliterated ; anterior to this they are open. The only inference therefore, that can be drawn from finding them closed, is that the child has been alive; at the same time, their being open, is no proof that the child was born dead.

With regard to the whole of the changes which take place in the circulation after birth, M. Billard has made a number of exceedingly interesting and important observations, which deserve to be recorded.

Children of one day old. In eighteen children of this age, fourteen had the *foramen ovale* completely open; in two, its obliteration had commenced; and in the remaining two, it was completely closed, and passed no blood. In the same infants, thirteen had the *ductus arteriosus*, open and full of blood ; in four, its obliteration had commenced; and in one, it was completely obliterated. This last was one of the two that had the foramen ovale completely closed. The *umbilical arteries* were open quite to their insertion in the iliac arteries; their calibre however, was diminished by a remarkable thickening of the coats. In all these children, the *umbilical vein and the ductus venosus* were open, and the latter vessel generally gorged with blood.

Children of two days old. In twenty-two infants of this age, fifteen had the *foramen ovale* quite open; in three it was almost obliterated; and in the remaining four entirely closed.

In thirteen of the same children, the *ductus arteriosus* was open; in six, the obliteration was commenced; and in three, it was complete. In all of the twenty-two, the *umbilical arteries* were obliterated to a greater or less extent. The *umbilical vein and ductus venosus*, though empty and flat, could yet be passed with a probe of considerable size.

Children of three days old. In twenty-two infants of this age, fourteen had the *foramen ovale* still open; in five, the obliteration had commenced; and in the remaining three it was complete. In fifteen the *ductus arteriosus* was still free ; in five, the obliteration had commenced; and in only two was it complete. These two were of the three which had the foramen ovale closed. In all the twenty-two, the *umbilical vessels and ductus venosus* were empty, and even obliterated.

Children of four days old. In twenty-seven infants of this age, seventeen had the *foramen ovale* still open; and in six of these this opening was very large and distended, with a great quantity of blood; in eight, the obliteration was commenced, and in two complete. In seventeen, the *ductus arteriosus* was still open; in seven, the obliteration had commenced, and indeed consisted only of a very narrow passage; in the three remaining, the obliteration was complete. The *umbilical arteries* were in almost all obliterated, even to the umbilicus, but were yet capable of being dilated, almost up to their insertion into the iliacs. The *umbilical vein* and the *ductus venosus* were completely empty and very much contracted.

Children of five days of age. In twenty-nine infants of this age, thirteen had the *foramen ovale* yet open, although the opening did not exist in the same degree in all; (in four of them its size was large, and in the nine others, moderate;) in six the obliteration was complete, and in the remaining ten almost complete. In fifteen of these twenty-nine, the *ductus arteriosus* was found open; in ten of them very freely so, and in the other five the obliteration was very much advanced. In seven, this canal was completely obliterated, while in the remaining seven it was nearly so. In all, the *umbilical vessels* were completely obliterated.

Children of eight days of age. In twenty children of this age,

the foramen ovale was completely shut in eleven; incompletely so in four, and open in five. In three, the *ductus arteriosus* was not obliterated; in six it was almost entirely obliterated; and in eleven the obliteration was complete. In fifteen the *umbilical vessels* were obliterated; the remaining five were not examined.

In children at more advanced ages. In the most of these, the fœtal openings are obliterated; nevertheless the *foramen ovale* and the *ductus arteriosus* may be found open as late as twelve or fifteen days, and even three weeks, without any particular accident happening during its life to the child.*

From these observations, the conclusions may be drawn,— 1. That the fœtal openings are not obliterated immediately after birth. 2. That the period at which they are obliterated, is extremely variable. 3. That most commonly the foramen ovale and the ductus arteriosus are obliterated towards the eighth, or the tenth day. 4. That the order in which they are obliterated is the following, viz. the umbilical arteries obliterate first, then the umbilical vein, the ductus venosus, the ductus arteriosus, and finally the foramen ovale. 5. That their obliteration proves that the child was born alive. 6. That it

* In some cases, these openings have remained for a much longer period. Mr. Burns relates the case of a person who lived to the age of between forty and fifty, in whom, on dissection, both the *foramen ovale* and the *ductus arteriosus* were open. The former was equal in size to the barrel of a goose quill, while the latter was equal to that of a crow quill. From the age of three years till his death, he was incessantly harassed with paroxysms of difficult breathing, cough, and discoloration of the skin. These became more and more frequent, and he eventually died of œdema and exhaustion. (Observations on some of the most frequent and important Diseases of the Heart, &c. By Allan Burns, Lecturer on Anatomy and Surgery, p. 17. 1809.)

Corvisart relates the case of a postillion who died at the age of forty-seven, in consequence of local injuries which he received, in whom, on dissection, the *foramen ovale* was found open, and more than an inch in diameter. The ductus arteriosus was tranformed into ligament. (An Essay on the Organic Diseases and Lesions of the Heart and Great Vessels. By J. N. Corvisart. p. 209. (American edition.)

A similar case is quoted by the same author from Morgagni, of a girl who died at the age of seventeen, in whom the foramen ovale was open, and large enough to admit the little finger. (Ibid. p. 229.)

By Dr. Perkins, a case is related of a child eleven months old, in whom, on dissection, the foramen ovale and the ductus arteriosus were both found open. (New-York Medical and Physical Journal, vol. 2, p. 444.)

By Dr. R. K. Hoffman, another case is recorded of a child who lived to the age of nine months, and in whom, on dissection, the foramen ovale was found open. (Ibid. vol. 6, p. 250.)

Another case is recorded, in which the foramen ovale was found open in a man who died at the age of sixty. (American Journal of Medical Sciences, vol. 15, p. 223.)

is impossible to infer from the fact of their not being obliterated, that the child has not respired, since it has been shown that the obliteration is very far from being made immediately after birth.*

The umbilical cord. This is the last peculiarity of the fœtal circulation which requires notice. After the birth of the child and the division of it from the placenta, it is well known, that after some days elapse, the cord separates from the child, and drops off. If, therefore, in examining a case, it be found that the cord has separated in the usual way, it is a proof that the child must have enjoyed life. As, however, the separation of the cord takes some days, it is obvious that its presence is no proof that the child was not born alive. As in the case of the foramen ovale and the ductus arteriosus, it has been supposed, however, that the successive changes which the umbilical vessels undergo, from birth until their final separation, might afford some indication of the length of time during which life had existed. M. Billard was the first person who properly ininvestigated these changes. The first of these changes he denominates a *withering* of the cord. This is the incipient stage of the process of desiccation, and varies in its commencement, from five hours to three days after birth. Of eighty-six infants, sixteen had the cord a little withered; and of these sixteen, one was five hours old, six were a day old, four were two days old, and four were three days old. In these cases, the cord was soft, a little bluish, very flexible, filled entirely the knot of the ligature, and the cut surface was still clean. Thus the withering of the cord may take place from the first to the third day after birth.

The next change which the cord undergoes, is that of *desiccation or drying.* The cord now becomes of a reddish brown colour; is flattened and shrivelled; its vessels are obliterated, and it becomes tortuous and dry. This process varies in its commencement from one and two days, to four days after birth. Out of eighty-six infants, twenty-four had the process of desiccation commenced. Of these, seven were only one

* Traité des Maladies des Enfans, &c. par C. M. Billard, pp. 476–80. Also Leçons de Médecine legale, par M. Orfila, vol. 1, p. 387. Second edition.

day old, eleven were two days old, three were three days old, and three were four days old. In all these the cord was blackened, shrivelled, and was loose in the ligature. The period at which the desiccation is complete, varies from one to five days after birth. The general period, however, is about the third day. Out of eighty-six infants, twenty-five had the cord entirely dry; of these, one was one day old—one, a day and a half old—five were two days old—nine, three days old —four, four days old—five, five days old.

By M. Billard, this desiccation is considered as a vital process, and his reasons are, in *the first place*, that the portion of cord beyond the ligature, or that which is attached to the placenta, does not undergo this process of desiccation—but decomposes and putrefies like any other dead matter—while the part of the cord between the ligature and the abdomen alone undergoes desiccation, a process entirely different from ordinary putrefaction. And in *the second place*, that the cord ceases to desiccate as soon as life ceases—that it does not desiccate at all in the fœtus which is born dead—that on the dead subject the cord undergoes a real putrefaction, which is altogether different from this desiccation.*

The inferences drawn by Billard, from the whole of his observations, are the following:

1. The desiccation of the umbilical cord takes place during life only.

2. At the moment of death this desiccation is completely suspended, or considerably diminished.

3. If the cord be fresh, or commencing to wither, the infant may either have been born dead, or have lived only a short time.

4. If the cord has either commenced desiccating, or be completely desiccated, the infant has lived at least one day.†

The next change which the cord undergoes, is that of *separation or dropping off*. The period at which this takes place

* Traité des Maladies des Enfans, &c. par C. M. Billard, p. 16. New-York Medical and Physical Journal, vol. 6, p. 303–4.

† Billard states that in fœtal subjects brought in for the purposes of dissection, he always observed, that they may be kept for several days without any drying of the cord The cord even remains sufficiently soft and its vessels sufficiently open to permit of their being injected. During life, on the other hand, the cord desiccates and

after birth, varies very considerably. In sixteen children examined by Billard, in whom the cord had separated, three were two days old; three, three days old; six were four days old; three were five days old; one, six days old; one, seven days old.* From the fourth to the fifth day after birth, then, would appear to be the ordinary period at which the cord falls off, although it sometimes happens sooner, and sometimes later. Generally, then, the cord *withers* during the first day, at the end of which *desiccation* commences; desiccation is complete on the third day, and between the fourth and fifth day the cord *drops off*. All this, of course, is merely general, being liable to numerous variations and exceptions.

Before dismissing the subject of the umbilical cord, there is another phenomenon which requires to be noticed. Anterior to the dropping off of the cord, there is observed *a red or inflammatory circle around its attachment to the umbilicus;* and by many, this has been supposed to be an evidence of vital action, and of course that the child must have been born alive. In relation to this sign, it is to be recollected that it is by no means invariably present. Indeed, according to the observations of Billard, it would seem to be more commonly absent. Out of eighty-six children, he found only twenty-six who exhibited evident traces of this inflammatory circle.† Its absence, therefore, is by no means to be looked upon as an evidence that the child was not born alive.

the vessels become obliterated from the first, second or third day For the purpose of testing these facts, he preserved a number of dead bodies of children for several days. The cord did not desiccate, but remained soft and flexible, even to the fourth and fifth day, and then it fell into a state of putridity. He also succeeded in injecting, by the umbilical cord, at the end of four days, the body of a still born child. The cord here was not the least desiccated, and was only very soft. (Billard, p. 21.)

When the umbilical cord is left to undergo putrefaction, it becomes greenish white; after that it puckers at its extremity—the cuticle of the cord is easily separated, although the cord itself does not separate from the abdomen, as it does during life. The cord can be torn in different places, and if it has been in water for some time, it is soft and very fragile. Billard has never seen the cord of a child, born dead, dried up before the fifth or sixth day, and in this case it preserves its circular form and even its suppleness for a considerable time. According to the observations of M. Billard, putrefaction of the cord never occurs, until this process has commenced in other parts of the body. The cord, therefore, is never affected in this way, until the abdominal parietes have turned green, and the different organs are in a state of decided decomposition. (Billard, p. 23, 4.)

* Billard, p. 26. † Ibid. p. 29.

Cicatrization of the umbilicus. This is the last change which these parts undergo; and the period at which it takes place, is from the tenth to the twelfth day after birth.

The foregoing investigations in relation to the successive changes in the umbilical cord, are important not merely to establish the fact of a child's having been born alive, but to determine how long it lived after birth.

(*c.*) *The distribution of the blood in the different organs of the body.* From what has been already stated, it appears that there is a very striking difference in the mechanism of the heart and blood vessels of the fœtus and those of the child after birth. A difference, therefore, in the general distribution of the blood itself in these two cases, would seem to be a very natural consequence. And such indeed is the fact.—This difference is especially observed in two organs, the *lungs* and the *liver*, each of which requires distinct examination.

1. *The lungs.* From the peculiarity of the vascular system in the fœtus, only a very small portion of the blood goes the round of the pulmonary circulation, the greater part passing directly through the foramen ovale, and the ductus arteriosus. In the fœtal state, therefore, the pulmonary bloodvessels are small, and contain scarcely any blood. As soon, however, as respiration is established, all this is changed, and then the whole mass of blood passes through the lungs for the purpose of undergoing the process of oxygenation. The pulmonary bloodvessels, accordingly, now become distended, and filled with blood. If, therefore, on examining any case, the bloodvessels of the lungs are found to be filled with blood, it is a proof that the child has enjoyed life. And on the contrary, if they are found empty of blood, it is a proof of the child's not having enjoyed life. The means of ascertaining whether the pulmonary bloodvessels are in one state or the other, are the two following:

(*a.*) *Making incisions with a knife into the substance of the lungs.* In the one case, a free effusion of blood follows the incision; in the other case, little or no blood follows.

(*b.*) *Ascertaining the actual weight of the lungs.* When the lungs have a large quantity of blood circulating in them, it is

very evident that they must weigh much more than when they do not have this blood circulating through them. As soon, therefore, as the blood ceases to circulate through the foramen ovale and the ductus arteriosus, and passes through the lungs, the weight of these latter organs must be increased, and just in proportion to the increased quantity of blood circulating in them. This, of course, is ascertained by simply weighing them. This is what is generally known by the name of the *static test*. To make this available, however, it is very obvious that some standard weight of the lungs in these two states must be fixed upon, otherwise, no conclusions in any individual case can safely be drawn. Now, to establish such a standard, one of two modes may be adopted, viz. either to take the average weight of a certain number of lungs, and let that be the standard, or to compare the weight of the lungs in the two cases with the weight of some third body, and thus ascertain the relative difference between them. Both of these modes have been recommended by different individuals, and to test their accuracy, numerous experiments have been made.

With regard to the former of these modes, the first great object is to settle what is the greatest weight to which the *fœtal* lungs ever attain. This being established, of course, whenever the lungs go beyond this weight, it is evident that respiration has taken place. By Schmidt, the extreme weight of the fœtal lungs, which they never exceed, is fixed at 1170 grains. Professor Bernt supports the observations of Schmidt. In twenty-four cases of still-born children, the greatest weight of the lungs, exclusive of a case of tubercles, was 993 grains; the medium was 550 grains. By Chaussier, it has, however, been established, that the fœtal lungs do occasionally weigh more than this. "Among 104 cases of still-born children, he found the weight of the lungs greater than 1170 grains in five cases; it was 1173 in one, 1282 in a second, 1297 in a third, 1343 in a fourth, and 1637 in a fifth." Now, it has been ascertained, that in a large proportion of cases, the lungs of children which have actually respired, do not weigh as much as is here stated. Out of twenty-five cases of children that

had breathed, reported by Schmidt, only four had their lungs weighing more than 1170 grains; out of thirty-seven similar cases by Bernt, only three weighed more. As to the extreme weights from the cases of Chaussier, leaving out of view the last, (1637 grains,) which may be considered as an extraordinary case, and an exception to a general rule, it is very rare that the lungs of a child which has breathed, weigh more than 1343. In thirty-seven cases of this kind, only three had the lungs weighing more.*

From all this, it is evident that this form of the static test can be applicable only in a very limited number of cases. Where the weight of the lungs exceeds the standard here laid down, it furnishes conclusive evidence of respiration; but as this is not the case in a large proportion of cases, the evidence deduced from it can only be comparative and presumptive.

The other mode of applying the static test, is that which is commonly known under the name of the person who first proposed it, M. Ploucquet. As this is a test of much celebrity, it requires special notice.

Ploucquet's test. This test was first announced in 1782, and is founded on the relative weight of the lungs to that of the whole body. From experiments made by M. Ploucquet, he drew the general conclusion, that the weight of the lungs before respiration is one-seventieth of the weight of the whole body; while after respiration has commenced, it amounts to one thirty-fifth; or in other words, that the blood introduced into the lungs in consequence of respiration, doubles their absolute weight.

Beautiful and decisive as this test appears to be, and correct as the general principle upon which it is founded certainly is, objections of a very serious character have been brought

* See on this subject an admirable review, written, I presume, by Professor Christison, in the Edinburgh Medical and Surgical Journal, vol. 26, p. 376.

Arrowsmith proposes 1000 grains as the extreme weight. He says, "when the fœtal lungs, being naturally formed and of healthy structure, exceed 1000 grains, such weight may be considered as constituting decisive proof that the floating of the lungs and their loose and expanded appearance, do not result from insufflation practised on a dead child, but must be a consequence of the continuance of respiration and of the circulation of blood through them, and therefore of life; and even if the weight exceed in any considerable degree 550 grains, the same inference is a reasonable presumption." (Cyclopædia of Practical Medicine, vol. 2, p. 689.)

against it. For the purpose of showing to what confidence it is entitled, it may be proper to notice some of the more important objections.

Examination of objections. a. There is no fixed proportion between the weight of the lungs and the weight of the body.

An appeal to facts and experiments must, of course, determine the value of this objection. It seems to be conceded on all hands, that M. Ploucquet deduced his theory from a very limited number of experiments. In one child born dead, he found the comparative weight of the lungs to the body to be as 1 to 67; in another, as 1 to 70; in a third which had been born alive, it was found to be as 2 to 70, or as 1 to 35. These were all the experiments which he had made, when he promulgated the general conclusion which he drew from them. As might naturally be expected from the novelty and importance of the subject, it has since then attracted the attention of the ablest medical jurists, and their researches have tended very materially to diminish the confidence originally placed in this test. The most extensive experiments yet made on this subject, were those conducted by M. Chaussier at Paris, and M. Schmitt at Vienna. The following are the results of some of their observations:

Experiments on the bodies of infants who had respired.						*Experiments on the bodies of infants who had not respired.*					
M. Schmitt.			M. Chaussier.			M. Schmitt.			M. Chaussier.		
Weight of the body.	Weight of the lungs.	Proportion between the wt. of the lungs and the body	Weight of the body.	Weight of the lungs.	Proportion between the wt. of the lungs and the body.	Weight of the body.	Weight of the lungs.	Proportion between the wt. of the lungs and the body.	Weight of the body.	Weight of the lungs.	Proportion between the wt. of the lungs and the body.
Gram.	Gram	Gram.	Gram	Gram	Gram.	Gram	Gram.	Gram.	Gram.	Gram.	Gram.
1012	35	1 to 29	1025	38	1 to 28	659	18	1 to 36	650	6	1 to 103
1065	31	34	1040	32	34	873	22	39	900	19	48
1091	66	16	1100	25	44	1065	70	16	1051	21	50
1099	35	31	1168	17	43	1361	36	37	1400	60	23
1222	31	39	1224	46	26	1572	39	40	1591	38	42
1257	18	70	1250	41	31	1577	33	47	1625	66	25
1466	23	62	1469	25	59	1915	41	44	1900	52	37
1518	31	48	1520	39	39	2090	35	59	2080	48	43
1803	43	43	1850	43	43	2177	32	67	2200	37	69
1908	32	87	1958	81	63	2221	23	79	2250	87	26
2002	54	37	2000	72	28	2252	51	43	2350	44	54
2160	57	38	2150	60	36	2589	74	34	2570	30	86
2366	46	51	2160	38	62	2648	43	61	2650	47	56
2404	36	66	2400	74	32	2758	35	79	2750	74	37
2191	70	35	2490	97	25	2981	44	67	2950	48	62
2758	87	31	2750	93	29	3102	70	44	3100	57	55
2893	49	59	2900	54	54	3313	61	54	3324	41	81
2998	70	42	3000	113	27	3451	49	70	3350	54	62
3207	61	52	3250	65	50	3502	61	54	3600	50	72
3294	80	41	3300	75	44	3660	57	64	3672	41	90
3731	75	49	3650	105	35	4150	50	83	4161	83	50
4150	105	39	4040	42	96	4185	83	50	4300	106	41
Mean propor.	$42\frac{5}{11}\frac{2}{30}\frac{8}{}$			$39\frac{1}{1}\frac{0}{2}\frac{9}{2}\frac{}{5}$		Mean propor.	$52\frac{8}{10}\frac{0}{3}\frac{}{5}$			$49\frac{9}{1}\frac{}{1}\frac{}{0}\frac{}{5}$ *	

* Dictionaire des Sciences Medicales, art Docimasie Pulmonaire—and a translation of the same in the Western Quarterly Reporter, No IV.

b. Even admitting that there is a fixed proportion between the weight of the lungs and the body, it is very different from that of M. Ploucquet.

This objection is certainly supported by the experiments of Schmitt and Chaussier already recorded, as also by those of Hartmann. This latter physician makes the proportion to be, in an infant which has not breathed, as 1 to 59; and in one which has breathed, as 1 to 48.

c. A third objection to this test is, that an excessive congestion of blood might occur in the lungs of a fœtus that had never respired, which should render them equal in weight to the lungs of a fœtus which had respired.*

To this M. Ploucquet himself replies, that it is not possible

* Mahon, vol. 2, p. 454.

for such a congestion to take place in lungs that have never respired, as shall render their weight equal to that consequent upon respiration; because the foramen ovale and the canalis arteriosus offer so easy a passage to the current of blood, even when flowing with the greatest rapidity, that no determination of consequence can exist towards the pulmonary vessels.

d. A fourth objection has been drawn from the alteration produced by putrefaction, in the relative weight of the lungs and body.

On this, Professor Mahon remarks, "that this may be the case if the putrefaction be very great; but then the fœtus cannot be subjected to any examination upon which a medico-legal decision can be founded. But if the putrefaction has not advanced far, as the lungs resist its effects longer than any other part, we may try the application of the proposed test, to corroborate the results afforded by the hydrostatic trials."*

The following observations and experiments have been instituted by myself, with the view of ascertaining the validity of this test:

Obs. 1. In a male child in whom the respiration had been complete, the relative weight of the lungs and body was as 1 to $35\frac{1}{4}\frac{9}{7}$.

Obs. 2. In a female child, which had respired perfectly, the proportion was as 1 to $37\frac{1}{2}$.

Obs. 3. In a male child, born alive, but both body and lungs in a state of incipient putrefaction, the proportion was as 1 to $46\frac{1}{3}$.

Obs. 4. This was a fœtus which had reached about the fifth month, and was judged to have been dead in the uterus about six days before delivery, owing to an accident which had happened to the mother. It was at present in a state of incipient decomposition; the lungs, however, were perfectly sound. The proportion between the weight of the lungs and the body, was as 1 to 29.

Obs. 5. A fœtus between the fifth and sixth month, in a state of decomposition — the lungs sound. The proportion here was as 1 to $39\frac{5}{7}$.

* Mahon, vol. 2, p. 454.

Obs. 6. In a male fœtus between the seventh and eighth month, which had not respired, the proportion was as 1 to 62.

Obs. 7. In a male child which had respired perfectly, as 1 to 44.*

Upon the whole, with regard to the general value of Ploucquet's test, it must be conceded, that in itself, it furnishes no conclusive evidence; as presumptive evidence, however, and when used for the corroboration or correction of other tests, it may be of great value.

Relative weight of the heart and lungs. From the degree of uncertainty hanging around the test of Ploucquet, Orfila was inclined to believe that a more definite proportion might exist between the weight of the *heart* and the *lungs*, and that this might serve as a test in these cases. He immediately put it to the test of experiment. For this purpose, he took the bodies of several fœtuses, and having weighed them accurately, took out the heart and lungs, and cut off the venæ cavæ and pulmonary veins, as well as the pulmonary artery and aorta, as near as possible to these organs. He then opened into the heart, to let out all the blood which it contained. After this, having washed them, he weighed them separately. The results were the following:

* To those who may wish to investigate this subject still further, I must refer to the 400 experiments detailed in Considerations Médico-légales sur L'Infanticide. Par A. Lecieux. p. 44.

Age of fœtus.	Duration of respiration.	Weight of the body.	Weight of the heart.	Weight of the lungs.	Propor. between the weight of the heart and lungs.
		Gram.	Gram. c.	Gram. c.	
At full time,	36 hours,	2280	13. 5	40. 5	3
———	4 days and 2 hours,	2000	10. 5	50.	$4\frac{6}{10}$
———	8 hours,	2650	19.	50.	$2\frac{8}{10}$
———	3 days,	2700	15.	59.	$3\frac{14}{15}$
———	2 days,	2800	16. 5	87.	$5\frac{1}{4}$
At eight months,	9 days,	1700	9. 5	66.	7
At seven months,	4 days,	1450	9. 5	54. 5	$5\frac{7}{9}$
At six months and a half,	2 hours,	800	5.	24. 2	5
At full time,	Died during delivery,	2305	14.	33.	$2\frac{2}{3}$
———	Born dead,	3100	17. 5	38.	$2\frac{1}{5}$
———	———	2200	9.	36.	4
———	Died during delivery,	2900	15. 5	29.	$1\frac{13}{15}$
———	———	1750	17.	35.	$2\frac{1}{17}$
At eight months,	Born dead,	1840	21. 5	61.	$3\frac{1}{7}$
At seven months and a half,	———	1650	8.	26.	$3\frac{1}{4}$
At seven months,	———	1270	5.	25. 3	5

From these and other similar experiments, Orfila drew the conclusion, that the relative proportion between the weight of the heart and the lungs was too inconstant and uncertain to draw any just inferences as to the fact of respiration having taken place.*

* Leçons de Médecine Légale, vol. 1, p. 319. Second edition.

2. *The liver.* Next to the lungs, the liver shows, in the most striking manner, the change which has taken place in the distribution of the blood after birth. It is a fact well known, that previous to the birth of the fœtus, the liver is much larger than it is afterwards. From the changes which take place in the circulating system immediately upon the commencement of respiration, the cause of this diminution in the size of the liver becomes very obvious. It has already been stated, that prior to respiration, the lungs have scarcely any blood circulating through them; hence they are small and collapsed. As soon, however, as respiration is established, the pulmonary vessels become charged with blood; the lungs are consequently much enlarged, and their actual weight greatly increased. Now there is no question that this blood is chiefly derived from the liver, and to this cause must its lessened size be principally attributed. Besides supplying the lungs with blood, there is another beneficial purpose answered by this diminution of the liver. If the lungs become enlarged and dilated, it is evident that the cavity of the chest must also be proportionably augmented, to enable them to perform their functions without restraint or injury. By the diminution of the liver, this is most effectually accomplished; inasmuch as by it the cavity of the abdomen as thus lessened, and the descent of the diaphragm facilitated.*

If this be a correct exposition of the reciprocal relations of the fœtal lungs and liver, it appears to me that an examination of the state of the *liver* must throw considerable light upon the question of a child's having been born alive.

If the size of the liver in the fœtal state be owing to the large supply of blood which it then receives, and if it uniformly loses a portion of this blood after respiration commences, it strikes me that a comparison of the weight of the liver before and after respiration, with the weight of the whole body, would assist us very materially in deciding whether a child had been born alive or not. The *principle* upon which the

* For a very able and satisfactory account of the state of the fœtal liver, see the paper of Mr. Bryce, published in the Edinburgh Medical and Surgical Journal for January, 1815.

proposed test is founded, is certainly just, and in practice it would not be liable to more serious objections than that of M. Ploucquet; on the contrary, it might serve in all cases to prove the accuracy of this latter test. To exemplify—if by the application of the test of Ploucquet in a case of supposed infanticide, it should be found that the lungs had acquired the weight of those of a child that had respired, and if by a subsequent examination of the liver, it should appear that this organ had lost none of its fœtal blood, then there would be just ground for suspecting that the increased weight of the lungs was owing not to respiration, but to some other cause. On the other hand, if experiments upon the liver should indicate that respiration has taken place, while the lungs themselves exhibit no sign of it, then the diminished weight of the liver must be attributed to some other cause, and no possible error could arise from this source. If, however, experiments both upon the liver and the lungs coincide in supporting the same opinion, who will deny that this concurrence of different tests would add greatly to the force and conclusiveness of the testimony.

By no writer on forensic medicine that has fallen under my examination, has this test been suggested; and I throw it out at present, in the hope that it may attract the attention of inquirers on this interesting subject.*

(*d.*) *The presence of ecchymosis or extravasation of blood on the body of the child.* This is the last sign to show that the blood has circulated after birth. The characteristics of true ecchymosis are slight tumour of the part, a peculiar and variegated

* This was originally suggested twelve years ago; and for obvious reasons, I leave it precisely in the form in which it was then written. Since then, I find this subject has attracted the attention of foreign writers. Professor Bernt, of Vienna, has more especially noticed it; and in his *Centuria Experimentorum*, has in all cases reported the weight of the liver. It does not appear from these reports, however, that any general and satisfactory proportion between the weight of the body and that of the liver, before and after birth, can be established. Orfila has collated some of these cases, and gives the following results:

discoloration of the skin,* produced by a rupture of the small vessels of the part, and a consequent effusion of blood into the surrounding cellular tissue. They are produced by blows or other injuries, and when present, they prove that the blood was still circulating in the body when the injury which produced them was inflicted. Injuries applied to a child in whom the circulation has ceased, are not followed by such phenomena. Professor Mahon mentions another possible cause of such extravasations, which should not be overlooked. He says they may result from putrefaction, which, by means of the air that is generated, bursts the veins, and then blood from very distant parts of the body is insensibly carried along to this outlet, so as to form a considerable extravasation.† It

Dead before or after birth.	Weight of the body.			Weight of the liver.			Proportion between the weight of the liver and body.
	lb.	*oz*	*dr.*	*oz.*	*dr.*	*gr.*	
Still-born, ...	6	2	0	4	0	70	24
do.	5	0	0	4	2	46	18
do.	5	6	0	5	1	15	19
do.	5	13	4	4	3	48	21
do.	6	0	0	6	0	60	15½
do.	6	2	2⅓	5	5	70	17
Having scarcely respired, ...	4	12	0	4	0	11	19
do.	5	14	4	4	6	24	20
do.	5	15	4	5	6	18	16½
do.	5	13	4	3	1	52	29
do.	4	6	0	3	6	18	19
do.	5	7	0	5	0	2	16⅔
Having respired more, ...	5	4	0	4	2	34	19½
do.	5	8	4	4	5	52	18½
Respiration perfectly established,	4	12	4	3	3	60	22
do.	5	0	4	8	1	13½	10
do.	4	15	0	4	0	11	19½
do.	5	13	4	4	3	13	21
do.	5	4	0	3	4	33	23½
do.	6	8	6	6	2	71	16½
do.	7	11	0	9	4	61	13
do.	5	10	4	5	6	35	15½

These results, according to Orfila, show conclusively, 1. That the weight of the liver was much more considerable in many infants in whom respiration had been completely established, than in those who were still-born. 2. That the proportion between the weight of the body and that of the liver, was often much less in those cases where respiration had been perfectly established, than in those who had not respired; which ought to be just the reverse, according to this test. (Leçons de Médecine Légale, par M. Orfila. Vol. 1, p. 393-4. Second edition.)

* When a patient lives throughout the course of an ecchymosis, the changes of colour which it undergoes are the following. At first there is a spot of a red or bluish colour, formed in consequence of the extravasation of blood into the surrounding cellular tissue; shortly after, it assumes a deep leaden or livid hue, and it then changes successively to a violet, green, yellow, and finally a citron colour. Usually, it is seven or eight days before it disappears entirely.

† Mahon, vol. 2, p. 389.

could not certainly be very difficult to discriminate in a case of this kind, yet it teaches us a practical caution of some consequence, which is, to pay particular attention to those circumstances which tend to favor the process of putrefaction, as the climate, season of the year, and place where the body is found.

Having thus considered the various changes which take place in consequence of the blood having circulated after birth, I come next to notice those which follow as the consequences of respiration.

Proofs of the child having respired after birth.

The act of respiration constitutes the great distinguishing feature between adult and fœtal life. Its commencement is succeeded by changes and revolutions in the animal economy, the most wonderful and interesting; and it is from these changes that we are to gain still further materials for determining the question, whether a child has been born dead or living. The points here to be investigated are, *the general configuration and size of the thorax; the volume of the lungs; the situation of the lungs; the colour of the lungs; the shape of the lungs; the consistency or density of the lungs; the specific gravity of the lungs; the shape and situation of the diaphragm; the condition of the intestines,* and *the state of the bladder.*

1. *The general configuration and size of the thorax.* On examining a child which has never breathed, the thorax will be found flattened, and, as it were, compressed. On opening into the thorax too, it will be found that the general size of this cavity is exceedingly small; the diaphragm also rises high into the thorax. All this, of course, is owing to the small size of the fœtal lungs, and to their peculiar position in the cavity of the thorax. As soon as respiration takes place, the lungs distend, and, as a consequence, the shape and size of the thorax is changed. Instead of being flat and compressed, the thorax is rounded and arched, and on opening into it, the cavity will be found enlarged in all directions. The diaphragm too will be found depressed. If, then, the thorax be found flat and small, it is an evidence that the child has not respired, and vice versa.

As the ideas connected with the terms *flat* and *arched*, *small* and *large*, are, in these cases, in a great measure only relative and arbitrary, it was suggested by Daniel, for the purpose of greater accuracy, that the chests of a number of infants should be subjected to measurement, in order to establish a standard of size both before and after respiration. With this view, he proposed that the circumference of the thorax should first be measured by a cord; then the height of it should be taken posteriorly, measuring along the dorsal vertebræ; and finally its depth, by taking the distance from the vertebræ to the sternum. Another mode is, simply to measure the diameter of the thorax from one hypochondrium to the other, and from the sternum to the vertebræ. It must be evident, however, that such measurements must be very uncertain in their results, owing to a great variety of unavoidable causes, such as the natural size of the child, &c.; and therefore the inferences drawn from them must inevitably lead, in many cases, to erroneous decisions. It is to be recollected that the thorax of a child is large or small, not so much according to its own actual size, as it is in proportion to the size of the child itself. For instance, in the body of a very small child, the thorax may nevertheless, be justly considered large, although much inferior in size to that of a child much larger. Hence any opinion formed from an examination and comparison of the thorax of different children must be exceedingly doubtful and uncertain. The best way after all, perhaps, is to trust simply to ocular inspection. A little experience in examining the appearance of different subjects, will much better enable a person to decide correctly, than by the plan proposed by Daniel.

2. *The volume or size of the lungs.* In the fœtal state, the lungs are comparatively small in size. As soon as respiration takes place, they become distended with air, and, of course, increased in volume. For the purpose of rendering the test drawn from the volume of the lungs more accurate and available, various modes have been proposed to ascertain the exact increase of volume in different cases. The only one which I shall notice, was proposed by Daniel.

Daniel's mode. This is founded upon the principle, that every solid body plunged into a liquid, displaces as much of that liquid as the space which it occupies. If, then, a solid body be plunged into a vessel of water, it will cause the water to rise in the vessel just in proportion to the quantity which is displaced. It is upon this principle that Daniel proposed that experiments should be made upon lungs that had not respired, as well as those which had respired, for the purpose of acertaining the different heights to which the water would rise. In the case of lungs which had respired, it is evident that these organs would not sink. To obviate this difficulty, he recommends that they be placed in a wire basket, the volume of which is known, and which may afterwards be deducted from the volume of the lungs.* With regard to this test, however, it does not appear that any conclusions can be drawn from the *absolute* volume of the lungs which can be depended upon with any degree of certainty.

3. *The relative situation of the lungs.* Anterior to respiration, the lungs occupy a small space at the upper and posterior part of the thorax, leaving the pericardium and the diaphragm almost entirely, and sometimes completely, uncovered. If imperfect respiration has taken place, the lungs will be found occupying the lateral portions of the thorax also. If respiration has been complete, they will cover completely the sides of the diaphragm, as well as the arch of the diaphragm. Although some three or four cases are recorded by Schmidt,† which tend to weaken somewhat the force of this test, yet in general, it is one of considerable value, and upon which much more reliance may be placed than upon the absolute volume of the lungs.

4. *Shape of the lungs.* In this respect, a striking and peculiar change takes place in some portions of the lungs in consequence of respiration. In the fœtal state, the lower margin of the left upper and right middle lobes are sharp and pointed, while after respiration has taken place, they become rounded and obtuse.

* Dictionnaire des Sciences Médicales. Western Medical Reporter, vol. 1, p. 322.

† Marc, in Dictionnaire des Sciences Médicales, Art. *Docimasie pulmonaire.*

5. *The colour of the lungs.* In the fœtus, previously to respiration, the colour of the lungs is *brownish red.* After respiration has taken place, they become of a scarlet or pale red at least those parts of them which have been permeated by air. It is very evident that this test, though generally true, must necessarily be liable to a great many exceptions. Disease in this respect, modifies very greatly the appearance of the lungs. In cases, for instance, where children have died from sanguineous engorgement of those organs, notwithstanding respiration may have been going on for several days, the colour of the lungs will be of a dark brown. The action of the atmosphere upon the lungs, too, changes their colour frequently. Thus, if, on opening the chest, the lungs be found of a brown colour, they change speedily to a much lighter colour. In making observations, therefore, on the colour of the lungs, it is to be done with great caution. It is proper to state here, that according to the experiments of Bernt, artificial inflation of the lungs never produces the scarlet tint of natural respiration. If it cause any changes of colour, it is only a pale or greyish red.*

6. *Consistence or density of the lungs.* In the fœtus and anterior to respiration, the lungs are dense and solid, resembling very much the solidity of the liver; when cut into with a knife, they have no crepitation. After respiration, on the contrary, the lungs are soft and spongy; air bubbles may be squeezed out of them, and when cut into they crepitate. All these phenomena, of course, are owing in the one case to the absence, and in the other, to the presence of air in the pulmonary cells. This is a very striking and important test. There is, however, one difficulty attending its application, which requires to be noticed. As will be shown hereafter, it is well established, that the lungs of a child which has never respired can be completely inflated with air, and in this case, the solidity of the lungs may become changed very much in the same way as if natural respiration had occurred. On cutting them with a knife, crepitation will also take place. It becomes necessary, therefore, to distinguish between these two cases.

* Edinburgh Medical and Surgical Journal, vol. 26, p. 367.

The modes of doing this will be fully pointed out directly, when speaking of the hydrostatic test. With regard to the crepitation which results from cutting into the lungs, the difference between them is, that when lungs which have actually respired are cut into, the incisions are followed by a greater or less flow of blood, while in artificial inflation this is not the case. From what has been already stated, the reason of this is perfectly obvious.

7. *Specific gravity of the lungs.* It is to Galen that we are indebted for the first notice of the changes effected in the lungs by respiration. "Ob eam causam," says he, "substantia carnis pulmonis ex rubra, gravi, densa, in albam, levem, ac raram transfertur."* The knowledge of this fact was not, however, applied to the purposes of forensic medicine until after the lapse of several centuries. It seems to have first attracted attention a little before the time of Morgagni, who says, "I do not know whether any one ever thought of making the experiment on this account, except a few lustra before my age.† Even Zacchias and Paré, who may be styled the fathers of forensic medicine, pass over it in silence. Haller speaks of it particularly, and notices some of the difficulties attending its practical application: "Vixit certe puer, cujus pulmo aquis innatat, neque vitium subrepere potest, nisi vel in os inflatus ær fuerit, quod verum respirationis genus est, vel putredo, neque ea modica, tantum produxerit æris, ut pondus specificum pulmonis, aliunde equidem ære exigua portione majus, aquæ pondere minus factum sit. Id modica putredo non efficit, major præstat. Neque tunc error in medici effato locum habet, si levi opera voluerit explorare, num et reliqua viscera natent. Id si viderit, non os in pulmonem per respirationem receptus causa erit natandi, sed aer ex humoribus carnibusque per communem legem putredinis expeditus."‡

In the whole range of forensic medicine, there is not a question more important, and at the same time more difficult, than the one which relates *to the floating of the lungs as a proof of*

* Opera Galeni de usu Part. lib. xv. cap. 6, p. 145, 6.

† Morgagni's Works, vol. 1, Lett. 19, p. 536.

‡ Haller's Elementa Physiologiæ, vol. 3, p. 279, 80.

the child's having been born alive. It has divided the opinions of medical jurists from the earliest periods, and even at the present day it still remains a subject of controversy. When it is recollected, how great and just an importance has been attached to it in trials for child-murder, and how embarrassing to courts and to juries have been the contradictory sentiments advanced concerning it by medical witnesses, the propriety of a lengthened investigation of the subject cannot be questioned.

For the purpose of rendering the subject as distinct as possible, I shall first state the test, and then consider the different objections which have been brought against its accuracy.

If the lungs of a child which has never breathed, be put into water, it is found that they are specifically heavier than the water, and of course sink. On the contrary, if respiration has once taken place, the lungs being specifically lighter than water, will then float. From these facts the general conclusion necessarily follows, that when the lungs of a child float in water, it must have respired, and therefore must have been born alive. And on the other hand, when they are found to sink, it is an evidence that the child has not breathed, and therefore was not born alive. This is commonly known by the name of the *Hydrostatic test.*

Let us now see whether it is safe to trust to the evidence furnished by this test, by considering the different objections which have been urged against it. These may be arranged under two divisions. The *first*, embracing those which go to show that the lungs may float, and yet the child not have been born alive. The *second*, embracing those which go to show that the lungs may sink in water, and yet the child may have been born alive.

1. *Objections brought forward to show that the lungs may float, and yet the child not have been born alive.*

Obj. 1. It has been objected, that a child may have been born dead, and yet the lungs will float in water, from having undergone putrefaction; and therefore, it is argued, that the mere floating of the lungs is no decisive proof of previous life.

With the view of giving this objection its full force, it may be proper first to consider the effects of putrefaction.

Strange as it may appear, it has nevertheless been a subject much debated, what the effects of putrefaction are upon lungs that have never respired; some asserting, that it renders them specifically heavier than water, and consequently, that they will sink when thrown into that fluid; while others, of equal respectability, maintain a contrary opinion. Both parties adduce experiments in proof of their particular assertions. The only solution that can be given to these contradictory results, is to admit that all the experiments have not been performed with sufficient care, so as to lead to conclusions uniformly correct. Every thing depends upon the *manner* in which they are conducted. The most accurate, I believe, were those performed by Mayer, and as they place this subject in a very just point of view, and relieve it of much of the obscurity in which it has been involved, it may not be improper to present a summary of his observations. From a very extended series of experiments, continued during a number of years, and executed with the utmost care and precision, Mayer found, on putting into water the lungs of still-born children, in whom, of course no sign of respiration or life had appeared, that they sunk to the bottom. After an interval of two or three days, the water in which they were left became turbid—the lungs changed in colour, and increased in volume—here and there an air bubble arose to the surface of the water, and at the same time a putrid odour became perceptible. All these appearances continued to increase daily, until the sixth, seventh, or, at the latest, the eighth day, when the lungs, both entire and cut into pieces, floated in the water in which they became putrid. On transferring the lungs to vessels containing clean water, they still continued to float, although on the slightest compression they instantly sunk.

Lungs placed in water, and exposed to the rays of the sun, swam on the sixth day. If they were suffered to putrefy where there was a free current of air, they rarely floated before the tenth or eleventh day. After the lungs had once floated, they remained in that state, emitting daily a more of-

fensive odour, and acquiring an increased volume, until the twenty-first, or at the latest, the thirty-fifth day. After that period, they gradually sunk down, without a single exception, to the bottom of the vessel, nor did they afterwards betray any disposition to float, although kept for seven weeks, and in some instances a much greater length of time.*

The foregoing experiments were made in the month of August. The lungs, both entire and cut into sections, were immersed in pure fountain water, and contained in vessels convenient and capacious. In short, every precaution seems to have been scrupulously observed, to render the experiments accurate and satisfactory.

My own experiments on this subject, although not numerous, go to confirm, in every essential point, those which have been just detailed.

If it should be objected to these experiments, that they are not satisfactory, because the lungs were separated from the rest of the body, it will obviate every difficulty to state a case in which the same result was observed in lungs which had not been taken out of the chest, until after they had become putrid. A case of this kind is related in which the child was certainly born dead. It had already become putrid when it was dissected—its vessels were full of air—and vesicles distended with it were seen on the surface of the lungs. On putting the lungs into water, they floated.†

From the foregoing experiments it thus appears, that in the *incipient* stage of putrefaction, lungs that have never respired will float in water; whereas they will sink if it has continued long enough to completely destroy their organization, and thus extricate all the air contained in them. These results have been corroborated by numerous other observations and experiments, and their truth cannot be doubted. It seems singular, indeed, that they should ever have been questioned, when a case perfectly analogous is witnessed in every person that is drowned. The body at first sinks; afterwards rises to the surface, when putrefaction has generated air sufficient to

* Mayer in Schlegel's Collectio Oposculorum Selectorum ad Medicinam Forensem Spectantium, vol. 1. p. 262, 3, 4.

† Edinburgh Medical Essays, vol. 6, p. 450.

render it specifically lighter than water; and finally descends again, upon the extrication of that air.

Such being the effect of putrefaction, it becomes a question of great importance, to determine in what way we may discriminate between the floating of the lungs, as caused by natural respiration, and that which is the result of decomposition.

Independently of the changes produced in the colour and general appearance of the lungs by putrefaction, there are other very characteristic marks by which they may be distinguished.

(*a.*) By the appearance of air bubbles on the surface of the lungs.

On this subject, Dr. William Hunter lays down the following rule : "If the air which is in the lungs be that of respiration, the air bubbles will hardly be visible to the naked eye; but if the air bubbles be large, or if they run in lines along the fissures between the component *lobuli* of the lungs, the air is certainly emphysematous, and not air which had been taken in by breathing."* Jaeger had before this made a similar observation. In lungs floating from putrefaction, he describes the air as contained in the form of bubbles under the external membrane of those organs, where the air introduced by respiration never finds its way.† This rule appears to be founded in truth, and accordingly has been adopted by the best writers on forensic medicine.

(*b.*) By the ease with which the air can be extricated from lungs which float in consequence of putrefaction. The evidence of this is to be found in the fact, that if lungs of this description, or any portions of them, be squeezed in the hand, they will immediately sink in water. On the contrary, no compression, however strong, can force out so completely the air from lungs that have respired, as to cause them to sink. This test is insisted upon by Marc, a very distinguished writer on this subject, as the most certain means of discriminating between the effects of putrefaction and respiration.‡

* On the uncertainty of the signs of murder in the case of bastard children. By William Hunter, M.D. F. R. S. Medical Observations and Inquiries of London, vol. 6, p. 284.

† Jaeger in Schlegel, vol. 5, p. 111.

‡ Dictionnaire des Sciences Médicales, vol. 10, Art. *Docimasie pulmonaire.*

(*c.*) By cutting out a portion of the internal part of the lungs, and putting this in water, to ascertain whether it will float. If the lungs floated as the result of putrefaction, this internal portion will sink, inasmuch as the air generated by decomposition is confined to the surface of the lungs. If, on the contrary, the lungs have respired, the internal part will float more readily even than that towards the surface.

(*d.*) By an examination of the other viscera of the body. Numerous observations have established the fact, that with the exception of the bones, the lungs resist putrefaction longer than any other part of the body. Faissole and Champeau, in experiments which they made upon drowned animals, observed that the lungs remained sound, after the whole of the body had become putrefied.* Mahon noticed the same fact in his dissections of dead bodies.† Camper ascertained, by direct experiments, that the head became so far decomposed by putrefaction, that the slightest force was sufficient to detach the bones of it from each other, as well as those of the arms and legs, before the lungs began to participate in the putrefaction.‡ I myself observed the same phenomenon in three instances. This was especially the case in a child found floating in the river. The body had become quite putrid—the scalp was distended with air, and so were the bowels. The lungs, on the contrary, were perfectly natural in their appearance, and untouched by putrefaction. From these facts the conclusion evidently follows, that if the rest of the body of the child which is the subject of examination, be unaffected by putrefaction, it may very confidently be inferred, that the floating of the lungs is not owing to putrefaction.

By a careful application of the foregoing tests, little or no difficulty can arise in deciding whether the lungs float from putrefaction or from respiration.

But suppose the lungs are found to be actually in a state of putrefaction, is the physician then justified in drawing any conclusions, or in giving any opinion? Mahon advises, in such cases, that it is better for the medical witness to be silent,

* Mahon, vol. 2, p. 400.
† Ibid. vol. 2, p. 400.
‡ Dissertation on Infanticide, by W. Hutchinson, M.D. p. 47.

and to leave to the magistrates the task of finding out other grounds of accusation.* Marc, however, answers this question in the affirmative, and proposes two characteristics to enable him to offer a positive decision. The first is, that lungs which have respired, notwithstanding they may have been attacked by putrefaction, always have a crepitus when cut into; whereas those which have never respired, although they float in water, are destitute of this peculiarity. The second, and which he considers the most decisive and certain, is this: that upon squeezing out from sections of the lungs the matter developed by putrefaction, they will *sink* if they are from a child born dead; but, on the contrary, if they are from a child born alive, they will, notwithstanding this, continue to *float.*†

Obj. 2. It is objected that a child may have been born dead, and yet its lungs may float in water, in consequence of their having been artificially inflated; and therefore, it is argued, that the mere floating of the lungs is no proof of previous life.

It has been doubted by some, whether artificial inflation of the lungs can ever be effected. Heister states that he proved, by actual experiments, that air cannot be blown into the lungs so as to cause them to float.‡ Hebenstreit also doubts whether it can be accomplished, in consequence of the mucus which is usually found to fill the fauces of a new-born child.§ Roederer, from the failure of his experiments on this subject, was led to the conclusion, that it can only be effected after the child has previously breathed. "A spiritu ori," says he, "inflato pulmones infantis non inflari dilatarique; nisi fœtus aliunde respiraverit."‖ Brendel is still more positive on this point. He believes artificial inflation to be utterly impossible, and assigns two reasons for his scepticism. The first is the resistance which is made by the thorax and diaphragm; and the second is the difficulty of introducing a pipe into the glottis, without which he thinks it is impossible to inflate the lungs. He adds, moreover, in confirmation of his opinion, that he

* Médecine Légale. vol. 2, p. 400.

† Manuel D'Autopsie Cadaverique, p. 134.

‡ Morgagni's Works, vol. 1, p. 536.

§ Anthropologia Forensis, etc. p. 405.

‖ Collectio Opusculorum Selectorum ad Medicinam Forensem Spectantium. Curante Dr. J. C. T. Schlegel. Vol. 5, p. 112.

made experiments upon pups that were killed while yet in the uterus; and although he attempted to force in the air by a bellows, yet no change was effected upon the lungs, and they sunk when put into water.*

A contrary doctrine is, however, maintained by a very large majority of the most respectable authorities in forensic medicine. Low admits the possibility of it, and tells us that Bohn, together with the medical faculty of Leipsic, concurred in the same opinion.† Ludwig says, it is certain that air may be artificially blown into lungs which have never respired, and that they will afterwards float in water.‡ In several experiments made to test this matter by the celebrated Camper, the result was uniformly in favour of this opinion.§ Jaeger, Buttner, and Schmitt, concur in the same, as do most of the French and English writers. Dr. Gooch says he inflated the lungs of a still-born child, and they floated in water as if the child had breathed some days.‖

From the foregoing detail of authorities, it is quite evident, that although artificial inflation of the lungs of a child born dead, is a thing perfectly practicable, yet it is not accomplished with as much facility as many have imagined. This consideration I conceive to be important, because it tends to weaken very much the force of this objection to the hydrostatic test. Still, however, the objection holds good, and there are not wanting occasions when artificial inflation might be attempted. It is not incredible that it might be the result of malice, designed to injure the innocent mother; or of maternal tenderness endeavouring to resuscitate a lifeless child. It becomes, then, a matter of great moment, to determine whether the existence of air in the lungs be the product of nature or of art; and it is fortunate for the cause of justice, as well as humanity, that this can be done.

(*a.*) The first test which I shall notice for this purpose, was originally proposed, I believe, by Buttner, and is founded upon

* Medicina Legalis sive Forensis, p. 136.

† Theatrum Medico-Juridicum. Cap. 12, p. 623.

‡ Institutiones Medicinæ Forensis, etc. p. 97.

§ Schlegel, vol. 5, p. 112.

‖ A Practical Compendium of Midwifery. p. 96. American edition.

the difference of the fœtal and adult circulation of the blood. In the former, it is well known that the blood does not pass through the lungs; whereas, as soon as respiration commences, the old passages are closed, and the whole mass is forced through those organs. If, therefore, a child has been born dead, the arteries and veins of the lungs are found destitute of blood, and in a collapsed state, notwithstanding any artificial inflation that may have been practised upon them. On the contrary, the vascular distention of the pulmonary organs proves that the child has breathed; for nothing but natural respiration can produce this effect.

(*b.*) A second method of determining this question, is by taking the absolute weight of the lungs, according to the *static test*, as already noticed.

(*c.*) A third test has very lately been proposed by M. Béclard. He asserts that the lungs of a child which has not respired, but which float in consequence of artificial inflation, may, by pressure, be deprived of all the air introduced into them — recover their original density, and sink in water; on the contrary, in a child which has *respired*, it is impossible by any pressure to force out the air so completely from the lungs, as to cause them to sink. This experiment is said to have been successfully repeated by M. Béclard, in the presence of witnesses.* The experiments of Prof. Bernt would, however, seem to show the contrary. In three cases of still-born children, after artificial inflation, "the lungs united with the heart; separated from it; divided into lobes and segments; nay even also when squeezed, floated on the surface of the water."† Two observations of an analogous character are also reported by Prof. Mendel of Breslaw.‡ Still more recent experiments, on the other hand, made in England by Mr. Jennings, go to support the accuracy of this test. In seven experiments reported by him, the lungs of children still-born and artificially inflated, were made to sink by compressing them. When the

* London Medical Repository, vol. 9, p. 161.

† See Remarks of Professor Christison on a Case of Infanticide by Dr. Scott, in the Edinburgh Medical and Surgical Journal, vol. 26, p. 74.

‡ See Dictionnaire des Sciences Médicales, Art. *Docimasie pulmonaire.*

child had breathed, this could not be done without actually mashing the lungs.*

(*d.*) A fourth test has been suggested by M. Marc. He considers that art can never completely inflate the lungs; and from the greater difficulty which attends the admission of air into the *left* lung, he is induced to believe that the inferior extremity of that lung will remain in a collapsed state, and float but imperfectly, or not at all.

This test is certainly ingenious, but I think hardly conclusive, inasmuch as there is some doubt whether the same appearances may not be observed after natural respiration has taken place; and if so, it can furnish no ground of distinction between respiration and artificial inflation of the lungs. Whether the lungs become gradually filled with air by respiration, or whether they are filled at once, is a question in relation to which differing facts are adduced. M. Portal appears long since to have established the fact that the right lung receives air much sooner than the left. In a kitten which he killed a few minutes after it was born, the right lung was of a whitish colour, filled the whole cavity of the chest, and swam in water; the left was of a dark red colour, in a collapsed state, and sunk in water. He accounts for this interesting phenomenon, by showing that there is a difference in the size and direction of the bronchiæ leading to the two lobes. Upon examination, he found the right one about one-fourth part thicker, and one-fifth shorter, than the left; besides, he found the passage to the right to be more direct than that to the left.† By Mr. Jennings, a case is related of a child which had breathed imperfectly for half an hour only, in whom the right lung floated, and the left lung sank, with the exception of a small part about its root.‡

(*e.*) Another test is that drawn from the state of the ductus arteriosus. This has already been treated of so fully, as to require no further elucidation.

* Transactions of the Provincial Medical and Surgical Association, vol. 2, p. 437. London Medical Quarterly Review, vol. 2, p. 365.

† Duncan's Medical Commentaries, vol. 1, p. 245. American edition.

‡ Transactions of the Provincial Medical and Surgical Association, vol. 2, p. 437.

Obj. 3. It is objected that there may be an emphysematous condition of the lungs which may make them float in water, even though respiration has never taken place.

The fact of such a condition of the lungs sometimes occurring, although noticed previously,* was first prominently brought forward by Chaussier, in some cases where he was obliged, in consequence of the smallness of the pelvis, to deliver by the feet, and where death took place during delivery. The lungs, on being put into water, floated. M. Chaussier explained this phenomenon by supposing, that in consequence of the violence done to the lungs during the delivery, an effusion of blood had taken place, the alteration of which had disengaged a quantity of air. Cases of this kind must, as a matter of course, be very rare. When they do occur, the mode of discriminating, according to Chaussier, is by squeezing them in the hand. On putting them into water after this, they will be found to have lost their buoyancy, and will sink. In these cases, the aeriform fluid exists only in the cellular tissue.†

Obj. 4. It has been objected, that "a child will very commonly breathe as soon as its mouth is born, or protruded from its mother; and in that case, may lose its life before it is born, especially when there happens to be a considerable interval of time between what we may call the birth of the child's head, and the protrusion of the body."‡

This objection did not originate with Dr. Hunter. It is noticed by Morgagni, and I find it discussed by the German writers early in the last century. It must be admitted, however, that the high authority of Hunter's name has given to it an importance which it otherwise would never have possessed, and it is on this account more especially deserving of examination. It involves two points, each of which is worthy of distinct elucidation. Is it possible that a child can breathe, when nothing more than its head is delivered? and if so, is it probable. that after having respired in this situation, it will die before the delivery of the rest of the body?

* Alberti noticed it in 1725, and Schmidt in 1806. (Edinburgh Medical and Surgical Journal, vol. 26, p. 374.)

† Considerations Médico-légales sur l'Infanticide. Par A. Lecieux. p. 55, 6.

‡ Dr. W. Hunter, in the Medical Obs. and Inq. of London, vol. 6, p. 287.

Although it is denied by some very respectable authors, that a child can perform the act of respiration when merely its head is born, yet the fact rests upon evidence too substantial to be contradicted. Independently of the authority of Dr. Hunter, we have several other writers who furnish us with decisive testimony on this subject. Marc alludes to a case of this kind reported by M. Siebold.* Capuron, a respectable French writer on legal medicine,† relates a similar instance which occurred in his own practice. Osiander informs us, that he has witnessed twelve cases in which the child breathed and cried as soon as the head was born.‡ Another case of more recent occurrence is related by Dr. Ward, an American physician. Here, after the head was delivered, the pains ceased, and the child began to cry. In a short time, however, the pains were renewed, and the child delivered alive and without any difficulty.§ By Dr. Scott, of Cupar-Fife, another instance of the same kind is recorded.‖

It must therefore be conceded, that a child may breathe and cry as soon as its head is delivered, although it is equally true, that it is by no means a common occurrence. Admitting, then, that a child may actually breathe in the situation we have supposed, is it probable that it will lose its life before the complete expulsion of the body? That it is not, appears to me of very easy demonstration; and if so, the objection loses at once almost all its force. Even among the writers who are most strenuous in support of this objection, I have not met with a single one who pretends to have witnessed an instance in which a child has actually died in this situation. Low, although he thinks it possible, relates no case of it. Dr. Hunter, whose professed object was to enforce all the probable exceptions to the hydrostatic test, gives us nothing more than his opinion, unsupported by facts. Mahon barely admits the possibility of it. Capuron, who is sufficiently sceptical on this subject, contents himself with recording the case already al-

* Manuel D'Autopsie Cadaverique, &c. p. 140.

† Capuron, p. 405.

‡ New-York Medical and Physical Journal, vol. 1, p. 372.

§ The American Journal of Medical Sciences, vol. 11, p. 546.

‖ Edinburgh Medical and Surgical Journal, vol. 26, p. 68.

luded to, in which the child was safely delivered. Even Osiander, with all his marvellous cases, does not present us with a single one of this kind. In point of fact, therefore, there is no instance recorded, so far as my knowledge extends, in which a child has actually expired under these circumstances. This, however, does not prove that it might not occur; and it is therefore necessary to inquire into all the possible causes which might produce its death. If a child expires after the delivery of the head, and before the expulsion of the rest of the body, its death will probably be owing to one or other of the following causes: 1. Natural debility of the child. 2. Pressure on the umbilical cord, interrupting the fœtal circulation. 3. Cessation of labour pains. 4. Unusual shortness of the umbilical cord. 5. A preternatural enlargement of the *body* of the child. 6. A tumour upon some part of the body of the child, mechanically interrupting parturition. I shall very briefly examine each of these in their order.

That *natural debility* on the part of the child cannot occasion it, seems to be proved by the very fact of respiration having taken place; for the exercise of that function so prematurely, necessarily implies a degree of vigour inconsistent with the supposition of such original feebleness.

That *pressure on the cord* should produce the death of the child, appears equally improbable. It is perfectly plain, that when this cause proves detrimental, it must be anterior to respiration, and when as yet the life of the child depends wholly upon the fœtal circulation. In the present instance, however, the child is supposed to have already breathed, and therefore any accidental interruption in the fœtal circulation cannot, in all probability, be attended with any injurious consequences.

Cessation of the labour pains. If, after the delivery of the head, there be a sudden cessation of the pains, there is no doubt that the child may be retained in this awkward situation for some time, and that it may even lose its life before it is completely expelled. Still it must be obvious, that the chance of such an issue is very much diminished in all those cases where respiration has actually commenced, inasmuch as the performance of this function proves not merely that the child

is vigorous, but also that its thorax and body are not so closely compressed by the parts of the mother as to endanger its life. Hence a child, under these circumstances, may be detained a considerable length of time, without jeopardizing its existence.

Unusual shortness of the cord. Cases of this kind occasionally occur. But here too the very fact of respiration having commenced, gives the child the best possible chance of being eventually born alive.

Preternatural enlargement of the body of the child, more especially of the shoulders, may prevent the delivery of the child, even after the birth of the head. That a child might die from this cause, is not disputed; but the very fact of its shoulders and chest being so large as to prevent delivery, shows how difficult, if not impossible, it would be, for it to respire. If, however, it did actually respire, then the hazard of a long detention in this situation, would, by this very circumstance, be materially diminished. In addition to all this, the cause would here be so very obvious on a bare inspection of the child, that no serious error could possibly arise from this source.*

* Since penning the above, I have received the following note from Dr. Hosack, communicating the particulars of a highly interesting case.

New-York, June 28, 1823.

Dear Sir—You have been correctly informed of the fact you refer to, of the death of an infant taking place between the birth of the head and the extrication of the shoulders. Such a case occurred in my practice in this city, in the year 1811.

Mrs. R——, a lady of a small, delicate frame of body, and the mother of several children, engaged me to attend her in her lying-in. The commencement of her labour proceeded with the usual symptoms that she had experienced upon former occasions, excepting that she suffered more severely from her pains, doubtless attributable to the child being larger than those she had borne in her preceding labours.

Being absent from home when sent for, another physician was called upon. We both arrived nearly at the same time. The child's head was born. It had been in that situation, without making any advance, for some minutes. The child had cried, and was yet living when I arrived. The pains were very active, but one of the shoulders was so firmly wedged above the pubes, that with all our exertions we could not release the child in time to preserve it alive. It was still-born; and I need scarcely add, that upon examining the child, besides its extraordinary size, an unusual breadth of shoulders was found to exist, to which circumstance doubtless its detention in the passage through the pelvis was to be ascribed.

This fact, the only one of this nature which I have met with either in practice or in the records of midwifery, presents a new case for the consideration of writers on legal medicine. As such I communicate it.

I am, very truly, yours,

JOHN B. BECK, M.D. D. HOSACK.

A tumour on the body of the child. This, of course, must be a very rare occurrence, and can never lead to any false decisions. I mention it merely because a case of this kind is recorded, in which "the head of the child was protruded, and the expulsion of the body for a considerable time prevented, in consequence of a large excrescence on the left breast of the child. During this interval, which was about half an hour, the child frequently cried so loud as to be heard by the attendants."* It does not, however, appear even in this case that the child eventually lost its life; at least nothing is stated to this effect in the account which is given of it. So far from supporting the objection of Dr. Hunter, which we are considering, it proves, in the most pointed and satisfactory manner, how little danger attends the child in this situation, when it enjoys the benefit of respiration. Besides, it should be recollected, that in all cases where delivery is prevented in consequence of the unnatural size of the parts about the shoulders, &c. the assistance of a physician, or at least of a second person becomes necessary. A witness, therefore, will always be at hand, to remove every ambiguity which may surround them.

From the foregoing discussion, it may, therefore, fairly be

In addition to the particulars stated by Dr. Hosack, he informed me, that judging from the size of the shoulders, he believes it would have been impossible for the child to have been extricated from its situation, without the aid of manual assistance. In a case of this kind, therefore, no difficulty could ever arise in coming to a prompt and correct decision.

Two other cases of a similar character, are recorded by Dr. Campbell, which I shall give in his own words. "In the one, it was the woman's first child, and was attended by Mr. John M'Candie, one of my pupils, now a practitioner in Tain, whom I accompanied, from the labour having been tedious. When the head was born, we both distinctly heard the infant cry. About five or seven minutes might have elapsed before the shoulders were disengaged; and although the infant appeared stout, yet it was still-born, and could not be resuscitated. The second case happened several years afterwards. This woman was the mother of several children, and was attended by Dr. John Clarke, now a medical officer in the army. The infant was large, had several loops of the funis entwined around its neck; and I was present before the head was born, when it began to breathe. In consequence of the size of the shoulders, at least seven minutes elapsed before they could be disengaged, and the child was lost." (Campbell's Midwifery, p. 150.)

It is to be regretted that in in all these cases, experiments were not instituted, with the view of ascertaining the state of the lungs, especially as it regards their weight, and floating in water.

* Mahon's Essay on Infanticide, translated by Christopher Johnson of Lancaster. See note by Mr. Johnson, p. 25.

concluded, that in reality very little danger attends the child under the circumstances which we have supposed.

I shall sustain this argument by the opinions of one or two writers, distinguished for their extensive experience, as well as practical sagacity. In a case of this kind, Burns directs that we should "attend to the head, examining that the membranes do not cover the mouth, but that the child be enabled to breathe, should the circulation in the cord be obstructed. *There is no danger in delay*, and rashly pulling away the child is apt to produce flooding, and other dangerous accidents." In another place he says, "some children die, owing to the head being born covered with the membranes, some time before the body This is the consequence of inattention; for if the membranes be removed from the face, there is *no risk of the child.*"* Denman also remarks, that "it was formerly supposed necessary for the practitioner to extract the body of the child immediately after the expulsion of the head, lest it should be destroyed by confinement in this untoward position. But experience has not only proved that the child is not, on that account, in *any particular danger, but that it is really safer and better, both for the mother and child*, to wait for the return of pains, by which it will soon be expelled; and a more favorable exclusion of the placenta will also, by this means be obtained."†

On a review of the whole of this part of our subject, it results, that a child may occasionally breathe as soon as its head is delivered—that the very fact of its breathing in this situation, gives it the best possible chance of being born alive—and finally, if it should even die, the cause of its death will generally be at once evident upon a mere examination of the body of the infant.

Obj. 5. There is still another objection which requires to be noticed, and this is that a child may respire while yet in the womb, and before any portion of it is delivered.

With regard to the occurrence of respiration in a child while yet in the womb and before the rupture of the membranes, the thing seems to me physically impossible, and there

* Principles of Midwifery, pp. 246, 376.

† Introduction to the Practice of Midwifery, p. 289.

is no evidence which can satisfy me that it has ever taken place.* This cannot be looked upon in the light of an objection that requires any consideration. When, however, the membranes are ruptured—the mouth of the uterus dilated, and the head of the child descends in such way as that the

* Nevertheless cases of this kind are said to have occurred, and have been gravely published to the world. In the 26th vol. of the Transactions of the Royal Society of London, Mr. Derham gives an account of a child which cried almost daily for five weeks before delivery! Another case is detailed in the 73d No. of the Edinburgh Medical and Surgical Journal, by Dr. Zitterland of Strasburgh, in Prussia. In this instance, the child is said to have been rather more civil than in the case of Mr. Derham, and began to cry only forty-eight hours before it was born! The most respectable writers, however, on Medical Jurisprudence, deny the *possibility* of the occurrence, and ridicule the instances of it which are upon record. Mahon, for example, asks, whether "the best possible authority is sufficient to establish so extraordinary a fact? Few writers," he adds, "venture to say with Bohn, that they themselves have heard it. Three-fourths quote hearsay, and adduce witnesses. The love of the marvellous often distorts facts—it invents them, and finds authority and proselytes. On the report of a fact attested by credible witnesses, we may give our assent to whatever is not contradictory in itself, but *conviction* is a much greater degree of assent, and requires other proof. Bohn may have been deceived by the parson's wife; he may have heard some gurgling noise, and may have been led away by a want of facts to prove his opinion. This mode of reasoning, and scarcity of facts, has given credit to Livy's history of a child, which cried "*Io triumphe*," in the belly of its mother. The folly has been carried so far, that we read of children that have laughed and cried in the uterus."—Johnson's Translation of Mahon on Infanticide, p. 18, 19.

Velpeau says on this subject: "It is sometimes so difficult to avoid all causes of error, all subterfuges, not to be deceived by strange and unexpected noises, such for example as are often produced by air in the intestines, that before we admit as positive a phenomenon which it is impossible to reconcile with the laws of physiology, the same person should have ascertained its existence repeatedly; in the mean time, I may say with Fontenelle, that, since learned and credible men have heard it, I will believe it, but I should not believe it if I had heard it myself." (Elementary Treatise on Midwifery, Meigs' edit. p. 226.)

In connexion with the foregoing, it is but fair to add the following: "A medical practitioner, unable to superintend a lingering case in midwifery under the care of his apprentice, requested a professional friend to give his occasional advice; the latter happening to call, found the young operator in anxious expectation of a second child, *one* being born some time before. Circumstances, however, occurred to render the operator's opinion somewhat doubtful, but he declared himself quite positive, *because he had heard the second child cry*. After all, the case ended in the single birth of a child that had been dead some time." (Johnson's Translation of Mahon on Infanticide, p. 109.)

To those who feel a curiosity in investigating this subject, the following references are furnished:

Johnson's Medico-Chirurgical Review, vol. 3, p. 221; vol. 6, p. 532; vol. 9, p. 524.
Edinburgh Medical and Surgical Journal, vol. 18, p. 550; vol. 30, p. 224; vol. 33, p. 215.
Philadelphia Journal of Medical and Physical Sciences, new series, vol. 4, p. 407.
American Journal of Medical Sciences, vol. 4, p. 248; vol. 8, p. 248; vol. 11, p. 546. vol. 14, p. 463.
Quarterly Journal of British and Foreign Medicine and Surgery, vol. 4, p. 221.
New-York Medical and Physical Journal, vol. 1, p. 372.
Baltimore Medical and Surgical Journal, edited by Prof. E. Geddings, M. D. vol. 2. p. 445.
Observations on Obstetric Auscultation, &c., by Evory Kennedy, M. D. p. 319.

mouth presents, so as to offer a ready communication between it and the external atmosphere, then imperfect respiration may take place, and in some cases has actually done so. The following cases, recorded on respectable authority, will illustrate this. The first is related by Prof. Holmes, of Montreal, Canada:—"On the 29th of October, 1828, I was called to a lady in labor of her sixth child. The fontanelle presented, but the pelvis being capacious, and her labours generally easy, no attempt was made to change the position. The head continuing to descend, the mouth lay on the pubis, and the examining finger could easily be introduced into it. The occiput did not yet occupy fully the cavity of the sacrum. At this time I heard sounds like the cries of a child whose mouth was muffled by some covering, but not very distinct, and not being at all prepared for them, I thought when they ceased, that they must have been produced by flatus in the intestines of the mother. In the course of a short time, however, the cries were repeated, and with the greatest distinctness, so as not to admit of a doubt that they proceeded from the child. The mother, much alarmed, inquired the cause of these noises, and required to be assured that they were not indicative of any danger. The pains being brisk, the head was soon forced down and expelled. The child was a female, and is still (August 1829) alive and thriving. This case appears to me so curious, though easy of explanation, when the position of the mouth is considered, that I am induced to draw up this notice, not having met with any thing similar on record, and as it is entirely different from the incredible stories we have of the fœtus emitting cries before the commencement of labour."*

Another case, analogous to this, is still more recently related by Mr. Tomkins, an English surgeon, which I shall record in his own language:—"I was, some time since, called to the wife of a blacksmith at Preston, who was in labour with her tenth child. I had attended her in several former confinements, and she had always had quick deliveries, as the pelvis was unusually capacious, and her pains were active. After I

* Edinburgh Medical and Surgical Journal, vol. 33, p. 215.

had been a few minutes in the room, I proposed and made an examination, and found the face presenting, and making its descent into the pelvis, the chin resting on the os pubis. A few strong pains succeeded, and I again examined to ascertain if the face had made any advance. I found it had done so, and that it was pressing on the perineum; but in making this examination, my finger passed freely into the mouth of the child, and it immediately gave a convulsive sob, and cried aloud to the great terror of the mother and of the bystanders, when they found that it was still in the womb. I had great difficulty in calming the agitation produced by this event upon the woman, whose pains were suspended for nearly an hour, but I eventually succeeded by explaining that the face was presenting, and that from the circumstance of my having passed my finger into the mouth, the air had gained admission and enabled the child to breathe; this, with a little spirit and water, and a dose of the ergot of rye, succeeded in bringing on the uterine action, and after two pains, the child was expelled alive and well, at least one hour after it had respired and cried in the womb."*

Now, in reply to the difficulties created by this objection, the following considerations may be urged:

In the first place, such cases must be exceedingly rare. Face presentations do not occur frequently. Out of 16,980 children born at the Hospital of Maternity at Paris, only 59, or 1 in 300, were of this nature.† Even when such presentations do happen, the occurrence of respiration anterior to delivery can take place only under very peculiar circumstances. In the two cases detailed above, it will be observed, that respiration occurred only in consequence of the introduction of the finger of the accoucheur into the child's mouth.

In the second place, even supposing respiration to take place, it must be very imperfect, unless the child continued to breathe after it was delivered, in which case, the objection would, of course, fall to the ground.

In the last place, if full and complete respiration took place under these circumstances, (a case hardly supposable, how-

* Lancet for July, 1834.

† Edinburgh Medical and Surgical Journal, vol. 19, p. 469.

ever,) this fact would indicate, most clearly, that the passages of the mother were so capacious as to offer no impediment to a prompt and safe delivery; and therefore no question of a criminal nature could ever be raised.*

From the preceding examination of objections to the *hydrostatic test*, I think that we may safely come to the following conclusions:

1. That when the lungs float in water, it must be from one of four causes: natural respiration—putrefaction—emphysema—the artificial introduction of air.

2. As the lungs may float from other causes beside respiration, their mere floating is no proof that the child was born alive.

3. As, however, it is possible to discriminate between the floating of natural respiration, and of that which is the result of other causes, it follows,

4. That, with due precautions, the floating of the lungs may be depended upon as a decided proof that the child has been born alive.

* I cannot take leave of this point, without presenting the following view taken of it by one of the highest authorities on every question relating to Juridical Medicine—I mean the Edinburgh Medical and Surgical Journal.

"*Uterine* respiration can never come in our way on such trials, (for infanticide,) for it takes place only under circumstances which render manual aid necessary to complete the delivery. *Vaginal* respiration is also so far similarly circumstanced. Respiration in the passages, as hitherto observed, takes place only, 1, in delivery by the feet, when the whole body but the head is protruded; and 2, in natural delivery, either when the head is expelled and the body remains in the passages; or 3, when, before the expulsion of the head, and after the rupture of the membranes, the hand is introduced to accelerate tedious labour. The first case cannot occur in medico-legal practice, so far as regards infanticide and concealment of pregnancy. The second can hardly be a cause of fallacy, as the circumstance of the child being able to breathe, shows that the constriction of the chest cannot be great; that the labour must therefore be speedily completed, and that the child's life is secured against the ordinary accidents which occur after this period of the labour. The third case renders it perhaps possible, that in tedious labour, air may reach the child in the passages, and be inhaled by other means besides the introduction of the hand; at the same time, such cases are by no means likely to occur in legal medicine, as the labour must be tedious, and consequently is not easily concealed. It appears, therefore, that the possibility of respiration before the close of labor, forms an objection to the employment of the hydrostatic test, only so far as it may occur in tedious natural labour. Now, independently of respiration being exceedingly rare in such circumstances, the objection thus constituted is important only *by preventing the inspector from relying on the test in particular and known circumstances*, not by being apt to lead him into error; because the fact of the labour having been tedious, may always be ascertained by moral evidence. This objection, therefore, is not of much consequence." (Edinburgh Medical and Surgical Journal, vol. 26, p. 372.)

II. I come now to examine another class of objections to the hydrostatic test, which have been much insisted upon, and which have tended, perhaps, no less than those which have already been considered, to shake the faith of the public with regard to its accuracy. I mean *those objections which are urged for the purpose of showing that a child may have been born alive, notwithstanding the lungs sink in water.*

Obj. 1. It has been objected that the child may have breathed, and yet the lungs, in consequence of diseases of various kinds, may have their specific gravity so increased as to cause them to sink in water. And, therefore, it is argued that the sinking of the lungs is no proof that the child was not born alive.

This objection has been deduced principally from analogy. It has been observed, that various morbid affections of the pulmonary organs of adults, as peripneumony, hydrothorax, calculi, schirri, ulcers, &c., will cause their subsidence in water, and hence it has been inferred, that the same might take place in the fœtus.

That the lungs of adults may undergo such changes from disease, as to cause them to sink in water, I am not disposed to deny, although I think it occurs less frequently than is generally believed. Haller informs us, that he has seen lungs of this description, which nevertheless continued to float. "Vidi sanguinem ex ruptis per funestam peripneumoniam vasis in pulmonem effusum, ut tamen nataret; vidi schirrhos, calculos, et lymphaticum coagulum, ut minime tamen subsideret."* He admits, however, having seen a case of peripneumony, in which the lungs sunk in water, and he adduces several other cases of a similar nature, upon the authority of others.† Heister records the case of a young man who died of phthisis, whose lungs were specifically heavier than water.‡ De Haen relates, that he met with three or four cases, in which portions of the lungs of adults sunk in water, and, he adds, that Diemerbroeck witnessed the same in a patient whose lungs were in a schirrous condition.§ Hoffman details

* Element. Physiologiæ, vol. 3, p. 231.
† Ibid.
‡ Hebenstreit, p. 401.
§ Ratio Medendi, p. 114.

the case of a young man who died of pneumonic fever, in whose lungs the same was observed.* In speaking of the dissections of those who died of pleurisy, in the Island of Minorca, Cleghorn says, that "in many the lungs were converted into a hard liver-like substance, and *sunk in water.*"† Dr. Baillie confirms the same general fact. "In consequence," says he, "of the greater quantity of blood being accumulated in the inflamed portion of the lungs, they become considerably heavier, and will *frequently sink in water.*"‡ Finally, there is recorded, in a late Journal, a case of "condensed lungs," occurring in a subject twenty-four years of age, and which immediately sunk on being immersed in water.§ These facts are sufficient to illustrate the grounds upon which the objection rests. And they prove incontestibly, that the lungs may occasionally be rendered, by disease, specifically heavier than water. It cannot be admitted, however, that these morbid conditions will frequently occur in the fœtus, for it is not exposed to the influence of the causes which usually produce them. Haller, notwithstanding his great experience and extensive learning, relates no instance of it, and expressly asserts, that they are very rarely found in the fœtal state. "In adulto homine *aliquando*, in fetu *rarissime*, ut pulmo calculis, schirris, aliave materie, morbose gravis in aqua subsideat, etsiquam respiraverit."‖ Brendel in speaking on this subject, relates only a single case of an abortive fœtus which had schirrous lungs, and considers it a singular occurrence.¶ I shall only add, in confirmation on this point, the opinion of Dr. Duncan, Jr. the accomplished editor of the Edinburgh Medical and Surgical Journal. "Unquestionably a piece of inflamed lung will sink in water like a piece of liver, *but we doubt that such inflammation was ever observed in the lungs of a new-born infant*, concerning which a question of its having been still-born could arise; and we deny the

* Opera Omnia, vol. 2, p. 140.

† Observations on the Epidemical Diseases of Minorca, by Geo. Cleghorn, p. 159, American edition.

‡ Morbid Anatomy, p. 33, American edition.

§ Edinburgh Medical and Surgical Journal, vol. 4, p. 301.

‖ Element. Physiologiæ, vol. 3, p. 281.

¶ Medicina Legalis, p. 10.

fact, that any portion of lungs which have breathed, will ever be rendered specifically heavier than water, by the mere settling of the blood in the lower portions after death."*

It appears then, as well from reason as from facts, that the objection is founded upon the existence of circumstances rather possible than probable; as such, however, it demands consideration, and it is necessary to suggest the means by which a false judgment may be prevented.

For this purpose we have a test both simple and certain. The objection takes it for granted that the child has breathed; whether feebly or vigorously is a matter of no consequence. Some part, therefore, of the lungs *must* contain air, and although the quantity of it may be too small to cause the whole of the lungs to float, yet if they be divided into a number of pieces, and any of them remain on the surface, there can be no hesitation about the conclusion to be drawn. Foderé states that he frequently made experiments upon lungs that were schirrous, or had congestions of blood, and he uniformly found, that although they sunk when put into water entire, yet, when cut into pieces, some of them always floated.†

An additional consideration, to aid in doing away this difficulty, is this. If the lungs are so diseased by tubercles, or any other morbid cause, as to render them specifically heavier than water, and thus cause them to sink, there can be no difficulty in detecting the presence of such disease, and, therefore, no error can arise from this source.

Obj. 2. It has been objected, that a child may have actually breathed, but yet so feebly and imperfectly, that the lungs shall not have received air sufficient to enable them to float; and hence it is argued, that the sinking of the lungs is no proof that the child was born alive.

In support of this objection, facts of a very pointed nature have been adduced. Heister relates the case of a very feeble infant, whose lungs sunk in water, though it lived nine hours after birth.* And a late writer on Infanticide states, that he had been informed by a physician to the Foundling Hospital

* Edinburgh Medical and Surgical Journal, vol. 12, p. 79, 80.
† Foderè, vol. 4, p. 497.
* Morgagni's Works, vol. 1, epist. 19, p. 536.

at Naples, who opened daily, on an average, the bodies of ten or twelve infants, which had generally died within twenty-four hours after birth, that he had hardly ever found more than a very small portion of the lungs dilated by air: this portion was frequently not larger than a walnut in its green shell, and but rarely larger than a hen's egg, and it was commonly situated in the right lung.*

The same method must be here adopted, as in cases where the lungs are diseased; they must be cut into several parts, and experiments instituted upon each. However imperfect the respiration has been, some portion of the lungs will necessarily be inflated, and therefore must float. Any error which might possibly arise, may be still further corrected, by the application of the static test, and by observing the state of the ductus arteriosus.

Obj. 3. It has been objected, that a child may be born alive without breathing; and therefore, in this case, the sinking of the lungs is no proof that the child was not born alive.

The fact upon which this objection is raised, cannot be questioned;† nevertheless, it is both safe and just to consider as dead, every child that has not breathed. Governed by such a rule, any error that may be committed, will always be on the side of mercy. It is true, that certainty is as desirable here as in any other case, for the destruction of a feeble child is a crime as enormous as that of a vigorous and healthy one, and the punishment of the murderer of the one, is equally an object of public concern with that of the other. But, in the language of a distinguished writer on this subject, "pour le punir, il faut le constater; et lorsque les limites de l'art nous refusent le degré de certitude que nous ambitionnons, la clémence, que dis-je, la crainte d'immoler l'innocence devra l'emporter sur toute autre consideration."‡

* A Dissertation on Infanticide, in its relations to Physiology and Jurisprudence, by W. Hutchinson, M. D. 1820.

† A case of this kind is related by Ouvrard, in which a child actually lived fourteen hours, without breathing. On dissection after death, the ordinary tests applied to the lungs gave no evidence of respiration, except the escape of a few bubbles of air on passing the right lobe under water. Every portion of the lungs, however, sank in water. (American Journal of the Medical Sciences, vol. 4, p. 247.)

‡ Manuel D'Autopsie Cadaverique, etc. par C. C. H. Marc, p. 140.

This objection, so far from showing the inconclusiveness of this test, serves only to establish more clearly its absolute necessity. It is by resorting to it alone, that the sacrifice of innocence can be prevented, for who would assume the responsibility of deciding that a child had been born alive, when no evidence could be discovered of its having respired?

From the foregoing considerations, it may, therefore, be concluded,

1. That when the lungs sink in water it must be from one or other of the following causes: the total want of respiration—feeble and imperfect respiration—some disease of the lungs, rendering them specifically heavier than the water.

2. As the lungs may sink from other causes than the absence of respiration, their *mere sinking* is no decisive proof of the child's having been born dead.

3. As, however, the sinking from the want of respiration may easily be distinguished from that which is the result of other causes, it follows,

4. That with due precautions, the sinking of the lungs is a safe test that the child was not born alive.

I have now gone through the discussion of this subject; and although the general conclusion is decidedly in favour of the accuracy of the hydrostatic test, yet nothing can be plainer than the necessity of an extensive acquaintance with the subject, to enable the professional witness to do justice to himself and to the cause of truth. It is much to be feared, that from the ignorance of some, and the precipitancy of others, great and fatal errors have not unfrequently been committed. It may not, therefore, be improper to present a summary of *practical rules*, for the guidance of the physician when called to the examination of a case, which, of all others, demands a combination of the exercise of the soundest judgment and the most profound knowledge.

(*a.*) As preliminary to any examination of the lungs, the child should be weighed, and the general appearance and condition of the body should be particularly noted, with the view of ascertaining the following points, viz: If the child be full grown, if the different parts of its body be well proportioned; if the

shoulders be uncommonly large, when compared with the size of the head; if any tumours are to be found upon the body; if the cord be unusually short; and, finally, if any symptoms of putrefaction be present.

(*b.*) The chest should then be carefully opened, and the following things noticed: the general shape of the thorax; the situation of the lungs, especially their relative situation to the diaphragm and pericardium — their volume — their shape — their colour; and whether there be any appearance of putrefaction.

(*c.*) The next step is to remove the contents of the chest, for the purpose of performing the necessary experiments upon the lungs. The aorta and vena cava should first be tied near the heart, and then cut beyond the ligatures; the trachea should then be also divided. The lungs, together with the heart, are now to be taken out of the chest, and to be submitted to an additional inspection, to ascertain whether they are sound or diseased, and if they are at all affected by putrefaction.

(*d.*) A convenient vessel containing water should now be provided, and particular attention should be paid to the temperature of the water in which the lungs are to be immersed. The reason of this will be perfectly obvious, when it is recollected that the specific gravity of water varies with its temperature; thus, for instance, water at 100° is lighter than water at 60°, and still lighter than at 40°. Besides, if the water be too hot, it will have the effect of expanding the lungs, and thus favour their floating, especially when there already exists a tendency to putrefaction. If, on the contrary, its temperature be too low, the air cells may be contracted, and some of the air be thus expelled. The temperature of the water should therefore be regulated by that of the surrounding air. Another precaution relative to the water is, that it should not be impregnated with *salt;* for, in consequence of the greater specific gravity of saline water, a body might float in it, which would sink in fresh water.

(*e.*) The lungs, together with the heart, should then be cautiously placed in water, and it should be observed whether they float or sink: if they float, whether above the surface of

the water, or just under it; if they sink, whether they do so rapidly or gradually.

(*f.*) The lungs should then be taken out of the water, and after tying the pulmonary vessels, they should be separated from the heart, and accurately weighed.

(*g.*) The lungs should then be replaced in the water, to see whether they sink or float, and in what way.

(*h.*) The two lobes should then be separated, and the same experiment repeated upon each, noticing the difference, if any, between them. If one only floats, see if it be the *right* one.

(*i.*) Each lobe should then be divided into a number of pieces, taking care not to confound the fragments of one lobe with those of the other, and upon each of these the same experiments should be instituted.

(*k.*) While cutting the lungs, observe if there be any crepitus; if the vessels are charged with blood; and if there be any traces of disease.

(*l.*) If any of the sections of the lungs float, they should be taken and squeezed forcibly in the hand. and then replaced in the water, to determine whether after this they will sink.

Having gone through these different processes, the conclusions to be drawn from them are evident. If there is nothing to be discovered on the body of the child, to favor the belief that it might have lost its life during delivery—if the lungs be not touched by putrefaction, nor be artificially inflated—if on cutting into them, a crepitus be perceptible — if the entire lungs, as well as the separate divisions of them, remain on the surface of the water—if, after squeezing portions of the lungs, they still continue to float—then the mass of evidence is strong, that the infant enjoyed perfect respiration. If only the *right* lung, or its pieces, float, the respiration has been less perfect. If some pieces only float, while the greater number sink, it proves respiration to have been still less complete. On the other hand, if neither the entire lungs, nor any section of them, float in water, the inference is, that the child never respired.

8. *State of the diaphragm.* It is very evident, that as soon as respiration commences, the cavity of the chest must necessarily be enlarged in every direction, to give play to the action

of the dilated lungs. In consequence of this, the chest externally becomes more elevated and arched, and internally the diaphragm descends. To a person accustomed to the examination of subjects, this descent will be obvious, and taken in connexion with the other signs of respiration, is one not to be disregarded. The best mode of measuring the elevation or depression of the diaphragm, is by the corresponding ribs.

9. *The discharge of the meconium.* The meconium is a dark pitchy matter, contained in the intestinal canal of the fœtus, and is evacuated shortly after birth, when the child is born alive. In relation to its precise nature, some difference of opinion has existed. The opinion, however, which seems most plausible, considers it to be the bile collected in the fœtal liver, and which is propelled from that organ into the intestinal canal, by the compression which the liver necessarily sustains as soon as respiration commences.* The same compression afterwards expels it from the intestinal canal. Upon this principle, the connexion between respiration and the discharge of the meconium, is perfectly plain. Too much stress should not, however, be laid upon this circumstance. For although Mr. Bryce asserts, that "there is no instance in which infants born at the end of the ninth month, have ever suffered this evacuation previous to their birth," yet we have the high authority of Dr. Denman to the contrary, who states, that he met with a case in which the meconium was discharged upwards of thirty hours before the child was born.†

10. *The state of the bladder.* Anterior to birth, it has been ascertained that the bladder contains a considerable quantity of urine. If, therefore, on examination, it should be found empty, the presumption is in favor of the child having been born alive, and of having lived sufficiently long to pass its urine by its own efforts. It is obvious, however, that this test is liable to many exceptions, and should not therefore be infallibly relied on. It is not impossible that under certain circumstances, a child may void its urine before birth, and on the

* Bryce on the fœtal liver. Edinburgh Medical and Surgical Journal. Blumenbach's Physiology, p. 359, American edition.

† Introduction to the practice of Midwifery, p. 395.

other hand, a child born alive, may die before it has performed that function.

Having thus discussed the various signs by which we are to determine whether a child was born alive or not, the following *general inferences may be deduced from them.*

1. If the ductus arteriosus, the foramen ovale, and the ductus venosus be obliterated, and if the umbilical cord be separated, the conclusion is certain, not merely that the child was born alive, but that it lived for a considerable time, whatever may be the state of the lungs.

2. Even should the ductus arteriosus, the foramen ovale, and the ductus venosus be still open, and the umbilical cord still attached, the conclusion may be drawn that the *child was born alive, and respired perfectly*, if the thorax be arched; if the lungs cover the diaphragm as well as the sides of the pericardium; if the edges of the right middle and left upper lobes, instead of being sharp, are rounded; if their colour is pale red, or scarlet; if, on being cut into, they crepitate, and the bloodvessels pour out blood freely from the incisions; if the lungs weigh 1000 grains or upwards; if they float in water with the heart attached, and when cut in pieces, each fragment floats; and if this floating of the lungs be proved not to be owing to putrefaction, inflation or emphysema of the lungs; and finally, if the ductus arteriosus be so diminished in size as not to be larger than one of the branches of the pulmonary artery, or if it be so much contracted towards the aortal cord as to form a truncated cone.

3. It may be inferred that a child has been born alive, but has only respired *imperfectly*, if the lungs present here and there streaks of scarlet intermixed with brownish red, and this especially in the right lung; if the lungs partially cover the diaphragm and sides of the pericardium; if the edges of the right middle and left upper lobes are more or less rounded; if portions only of the lungs float in water, and if this be proved not to be owing either to putrefaction, inflation or emphysema; and finally, if the ductus arteriosus be somewhat lessened in size, and have assumed the conical shape.

4. It may be inferred that a child was *not born alive, and*

has not respired, if the thorax be flat and compressed; if the lungs occupy only the posterior and superior part of the thorax—small in volume, and leaving uncovered the diaphragm and the sides of the pericardium; if the edges of the right, middle and left upper lobes be sharp; if the colour of the lungs be dark brown; if they do not crepitate when cut into, and no blood follows the incision; if the entire lungs, as well as every fragment, sink rapidly in water; if their weight be under 500 grains; and finally, if the ductus arteriosus be cylindrical, and of the size of the trunk of the pulmonary artery, and more than double the size of the two branches.

Of the various modes in which the life of a new-born child may be destroyed or lost.

Like the causes of abortion, these may be divided into two classes, viz. those which are *criminal*, and those which are *accidental*. As in every case of alleged infanticide, a question may be raised as to whether the death was owing to the one or the other of these sets of causes, it becomes necessary to examine them separately and in detail.

Criminal modes resorted to for the destruction of a new-born child.

1. *The intentional neglect of tying the umbilical cord.* The majority of medical practitioners, from the time of Hippocrates down to the present day, concur in the necessity of tying the cord, to obviate fatal hæmorrhage which might ensue from the omission of it. Such was the unanimity of opinion on this subject, that previous to the 17th century, a doubt was not entertained with regard to it. According to Fodéré,* *J. Fantoni*, professor of anatomy at Turin, was the first who suggested that this precaution was useless, and that the neglect of it was unattended with any danger to the life of the child. After his time, the same opinion was adopted and defended by *Michael Alberti*, in 1731, and *J. H. Schultzius*,† in 1733, both professors in the university of Halle. In 1751,

* Fodéré, vol. 4, p. 502.

† In a dissertation entitled, "An Umbilici deligatio in nuper natis absolute necessaria sit." Halæ, 1733.

Kaltsmidt maintained the same doctrine at Jena.* The arguments offered by them in defence of their opinion are the following: 1. They maintain that the umbilical vessels, whether cut or torn, have a sufficient contractile power to prevent any great loss of blood. 2. That, because in other animals it is not necessary to tie the cord, therefore it is equally useless in the human species. 3. Kaltsmidt adduces an argument from the analogy of arteries contracting spontaneously in some surgical operations, and he thence infers, that a similar contraction would take place in the vessels of the cord.†

Let us examine these arguments for a moment. With regard to the *first*, it is obvious that it is nothing more than a reiteration of the subject in dispute, with the addition of an attempt to explain the reason of it. To say that the vessels of the umbilical cord contract sufficiently to prevent fatal hæmorrhage, is, in fact, to say nothing more nor less than that such hæmorrhage does not take place. It offers neither fact nor argument in relation to the disputed point. This, therefore, requires no examination.

The *second* argument is drawn from analogy. To render it therefore available, the analogy between the human cord and the cord in animals must be complete. This, however, is not the case. That there is some difference in the structure of the human cord and that of other animals, is not merely a rational conjecture, but proved by actual observation. Prof. Brendel, in examining pups and heifers, found their umbilical vessels full of rugæ or folds throughout the whole of their course, and their size much less also in proportion.‡ In another place, the same writer says, that in brutes the vessels of the cord are much smaller than in man; and that when the animal is born, they are in a measure closed by a kind of cellular structure.§ From this it appears, that in brutes there is a peculiar construction of the vessels of the cord, tending to interrupt the flow of blood through them, and favouring their speedy contraction after they have been cut. Besides, the

* Foderé, vol. 4, p. 509.

† Mahon, vol. 2, p. 422, &c.

‡ Medicina Legalis sive Forensis, p. 9.

§ Ibid. p. 189.

manner in which the cord is separated in brutes, facilitates contraction. It is never *cut* in them; it is *torn asunder*, and the disposition of a vessel to contract under such circumstances is greatly increased.

The *third* has still less force than the foregoing. That arteries of inconsiderable magnitude frequently contract spontaneously, is granted; but that vessels of a size equal to that of the umbilical ones, do generally contract of themselves, cannot be admitted, when we know that very dangerous hæmorrhages sometimes occur from vessels even much smaller than those of the cord.

After all, the whole question rests upon a simple matter of fact, and this fact is, whether the omission of the ligature upon the cord has ever been attended with fatal hæmorrhage. That it has been so, cannot be questioned. Among others, a very striking case is recorded by Foderé, which he was called upon by the authorities to examine. An illegitimate child, immediately after its birth, had been carried about three leagues to a woman who was to perform the office of nurse. Finding it very feeble, the nurse, on examination, ascertained that it was covered with blood, and that the ligature around the cord was quite loose. The child died shortly after. On examination, Foderé reports that he found the body extremely pale; without any sign of violence or wound; the umbilical cord flaccid; the lungs floated perfectly, not only alone, but with the heart attached—when cut into pieces, too, every piece floated; the heart completely empty, as also the large vessels, the vena portæ, the ductus venosus, the umbilical vessels, and even the capillary system of vessels. On weighing the blood found in the child, he found that it did not amount to two ounces. From all this, he concluded very justly that the child had enjoyed perfect life, and had died from umbilical hæmorrhage.*

Dr. Campbell states that he met with two cases in which infants were destroyed, one by the accidental, and the other by the intentional, removal of the ligature from the cord.†

The following case is recorded by Dr. Hutchinson; although

* Traité de Médecine Légale, etc. Par F. E. Foderé. Vol. 4, pp. 515-16.

† Introduction to the Study and Practice of Midwifery, p. 151.

the life of the child was saved, it shows conclusively the great danger attending hæmorrhage from the cord. "The navel-string of a living infant was tied in the usual way; but by accident, the funis separated very close to the ligature. Two hours afterwards, the practitioner was sent for; and on his arrival, he found the infant on the point of dying from hæmorrhage that had just occurred from the navel-string. The infant had been washed and dressed in the usual way, and had not cried after it had been placed in bed with the mother; soon after which, the hæmorrhage was discovered. The child was fortunately preserved, by very assiduous subsequent care."*

Although there can be no question, therefore, that fatal hæmorrhage may, and has occurred, from not tying the umbilical cord, yet it is equally certain that it does not necessarily do so. Observations, to a great extent, have been made, which prove that this precaution has been omitted, without any serious consequences resulting. It is stated that M. Klein has reported one hundred and eighty-three cases of sudden labours, in many of which the cord was ruptured, and in twenty-one cases close to the abdomen, yet there was no fatal umbilical hæmorrhage.† In no case, therefore, is the mere absence of the ligature to be taken as conclusive evidence of death by hæmorrhage.

Signs of death by hæmorrhage from the cord. These are the following:

(*a.*) Paleness of the surface, with a peculiar waxy appearance.

(*b.*) Paleness and loss of colour in the muscles and internal viscera.

(*c.*) The absence of the usual quantity of blood in the heart and bloodvessels. By some it is stated, that in cases of hæmorrhage, the heart and bloodvessels are completely empty. This, however, is not the case. Generally speaking, "if three ounces of blood can be collected, it may be presumed that the child has not died of hæmorrhage."‡

* A Dissertation on Infanticide, &c. By William Hutchinson, M. D. p. 87.

† A Manual of Medical Jurisprudence, by M. Ryan, M. D. p. 144. Griffith's ed.

‡ Cyclopædia of Practical Medicine, vol. 2, p. 694.

2. *Exposing a new-born infant to the action of cold.* It is needless to dwell upon the necessity of those precautions which are generally resorted to after the birth of a child, in order to preserve a proper degree of temperature. They are founded equally upon experience and good sense. If, therefore, they have been neglected in any case, it is just to attribute it to *design*, unless circumstances render it probable that it proceeded from ignorance or want of the proper means. In either case, however, the physician may be calledupon to decide, whether the death is to be attributed to the action of the cold, or to some other cause.

Signs of death by exposure to cold. These are given by Foderé in the following terms: "If the body of an infant be found stiff, discoloured, shrivelled and naked, or with only a slight covering on it in a cold place—buried under stones, or under the earth—and from trials upon the lungs, it is evident that it has respired; and if the great internal vessels are found gorged with blood, accompanied with an effusion of blood into the cavities, whilst the cutaneous vessels are contracted and almost empty, and when no other cause of death can be detected, one cannot do less than attribute it to the cold, and consider this abandonment and neglect of care, the necessity of which is obvious to the dullest comprehension, as a manifest intention to make away with the child."*

3. *Keeping from the child the nourishment necessary for supporting life.* It is not easy to say how long a new-born child may sustain life without food. It is evident, however, that it ought not to be delayed for any length of time. Foderé says the neglect of it for twenty-four hours, is not unattended with danger. In these cases, the child is generally found exposed in some deserted place.

Signs of death from the want of food. As death in these cases does not take place until the child enjoyed life for a certain length of time, the first thing to be established, is that the child has lived long enough to die from this cause. This may be done by inspecting the foramen ovale, the ductus arteriosus, the ductus venosus, but more especially the umbilical cord,

* Foderé, vol. 4, p. 505.

according to the signs laid down in a previous part of this essay.

As children who die from want of food are generally exposed also, they sink under the combined operation of exposure and want of nourishment. They will be found, accordingly, to present the same appearances as in the last case;* and besides these, there will be general emaciation of the body, and on dissection, the stomach and intestines will be found empty, the gall-bladder will be enlarged, and bile found generally effused in the stomach and intestines.†

4. *The infliction of wounds and injuries of various kinds.* This is among the most common of the modes by which the life of a new born child is wilfully destroyed. Death in these cases may be produced in various ways, some of which I shall notice.

The introduction of sharp pointed instruments into different parts of the body. Gui-Patin relates of a midwife who was executed at Paris for having murdered several children, by plunging a needle into the head while presenting at the os externum.‡ Brendel also speaks of the same horrible practice. An instance of this kind is related by Belloc, where, upon examination, he found the instrument had penetrated to the depth of two inches into the substance of the brain.§ Needles, or other sharp instruments, are sometimes thrust into other parts of the child, such as the temples, the internal canthus of the eyes,‖ the spinal marrow, the neck, the thorax about the region of the heart,¶ and the abdomen. Sometimes a sharp instrument has been run down the throat, and up into the rectum. A case is recorded in a recent journal, in which the child was evidently destroyed in this way.**

* Foderé, vol. 3, p. 238.

† Besides keeping food from the new-born child, its life may be endangered and destroyed by giving it improper food. Dr. Campbell states that he has known several illegitimate children destroyed by giving them to be nursed by women whose milk was twelve or fourteen months old, the parties concerned being well aware that the children could not long subsist on such nourishment. (Midwifery, p. 151.)

‡ Mahon, vol. 2, p. 409.

§ Cours de Med. Leg. p. 93.

‖ Prælect. Academ. J. G. Brendelii, p. 188.

¶ Foderé, vol. 4, p. 492.

** Case of Elliot and Bease. Edinburgh Medical & Surgical Journal, vol. 35, p. 457.

Signs. In all cases where death has been produced in the preceding ways, dissection alone can reveal the cause. Where the instrument has been run into the brain, the head must be shaved, when a slight ecchymosis will be perceived around the puncture; after this, the examination must be pursued into the substance of the brain, to ascertain the nature and extent of the injury. Indeed this is the only way in which injuries of this kind can be distinguished from tumours and extravasations on the scalp, which may occur during ordinary delivery, and be wholly unconnected with any malicious intent. In punctures of other parts of the body, the same course must be pursued. The wound must be probed, and the dissection prosecuted to see how the internal organs are injured.

Wounds and bruises. This is another mode frequently resorted to for destroying the new-born infant. They may be found on any part of the body; the more common part, however, is the head. For the purpose of ascertaining the effects upon the head of a child falling from different heights, the following very instructive experiments were made at the Lying-in Hospital, and are detailed by Leceiux:

"1. Fifteen infants who had died after their birth, but in whom there was no alteration in the bones of the cranium, were selected, and after having been raised up by the feet so that the head was at the height of about eighteen inches, were suffered to fall perpendicularly upon a hard floor; and by anatomical examination, it was found that in twelve of them there was a longitudinal or angular fracture of one of the parietal bones, and sometimes of both.

"2. In the same manner fifteen infants were suffered to fall from a height of three feet, and on dissection there was found, in twelve cases, a fracture of the parietal bones, in some extending to the os frontis. When suffered to fall from a greater height, the membranous commissures of the cranium were relaxed, and even broken in some places; frequently the form of the brain was changed, and in some cases there was found under the meninges, or in the thick part of the meninges, an ecchymosis, an extravasation of blood produced by the rupture of vessels; and it was only in infants whose bones were very soft and flexible, that no fracture was found.

"3. After having placed on a table the head of a child that had died soon after its birth, it was pressed in different places very strongly by the two thumbs on different parts of the surface; and in fifteen experiments of this kind, seven caused longitudinal fractures of greater or less extent in one or other of the parietals; in others, there was only perceived a depression or sinking of the bones. In the greatest number, the head was deformed or flattened, and the membranous commissures exhibited a sensible relaxation.

"4. Finally, the head, supported on a table, was struck strongly, and in different places, with a short round stick. This experiment always caused a deformity or flattening of the head, multiplied fractures, with separation of splinters, relaxation, in some places rupture of the sutures, and finally extravasation of blood."*

Signs. In cases of wounds, the points to be determined are, whether the wounds are necessarily mortal, and whether they may not have been the result of accidental and unavoidable circumstances. With regard to wounds of the head, it is to be recollected that the heads of children are not unfrequently tumified and ecchymosed from compression, during a difficult and tedious labour. In some cases, too, a peculiar sanguineous tumour forms spontaneously on the head of the newborn child.† Arising in this way, these tumours are not attended with any danger to the child, and they are never complicated with fracture of the cranium. Where this latter is the case, it is invariably a sign of criminal interference, and may prove fatal.

In all examinations of contusions, two cautions ought to be observed: viz. to distinguish them from the discoloured spots which appear on the surface of the body at the commencement of putrefaction, and, not to confound accidents which may occur during dissection, with those resulting from blows and other acts of violence.

Luxation and fracture of the neck. This is a mode of infanticide frequently resorted to, and is usually perpetrated by

* Considerations sur l'Infanticide, par Lecieux.

† See an excellent paper on this subject by Prof. Geddings, the able and learned editor of the North American Archives of Medical and Surgical Science, v. 2, p. 217.

forcibly twisting the head of the child, or pulling it backwards.* In such cases, the vertebræ are fractured, the ligaments ruptured, and death is caused by the injury inflicted upon the spinal marrow.

Signs. The mode of identifying this kind of death, is by the local derangements about the part—by the position of the head—and, on dissection, by the fracture of the first or second vertebra, or both, and by the extravasation of blood among the cervical muscles. This last circumstance will show, that the violence has been committed on a living subject.

5. *Asphyxiating a new-born child, or putting a stop to its respiration.* This may be accomplished in various ways: by drowning; hanging or strangulation; smothering under bed clothes; suffocating, by thrusting various articles into the mouth and nostrils; finally, by exposure to noxious airs.

Drowning. If a child be found immersed in water, the questions which require to be determined are the following. In the first place, was the child born alive, or in other words, has it respired. In the second place, supposing it to have been born alive, was it put into the water before or after its death. The first of these is to be determined by the means already indicated. With regard to the signs of drowning, they are precisely the same in the infant that they are in the adult, and a careful examination is therefore to be made, with the view of ascertaining whether these are present or not.

Signs of drowning. In cases of drowning, generally speaking, the countenance, as well as the whole surface of the body, is cold and pallid; the eyes are half open, and the pupils considerably dilated; the tongue is protruded to the edges of the lips, and sometimes it is wounded, and the mouth and nostrils are covered with froth. In some cases, instead of the countenance being pallid, it is swollen and livid. On *dissection*, there will be found a watery and bloody froth in the trachea or bronchiæ; the right auricle and ventricle will be full of blood, while the left will be empty; the lungs will be expanded and generally livid. On opening into the stomach, it will be found to contain more or less of water: the brain will be found more

* Mahon, vol. 2, p. 409.

or less congested with blood. The blood itself, in cases of drowning, remains fluid, and follows freely the incisions of the scalpel. Much light will sometimes be thrown upon these cases, by finding in the stomach a portion of the fluid in which the child has been drowned. As this could only have got there by deglutition, it proves that the child was living.

Such will be the appearances, external and internal, where the subject has been put into the water in a living state, and where its death has been occasioned by the submersion. In cases where the subject, previously dead from some other cause, has afterwards been thrown in the water, all these signs will be absent.

Hanging. In this case, the general cause of death is precisely the same as that in drowning, viz. suspension of the respiration. The signs, therefore, in the two cases are the same, except so far as they are modified by the application of the ligature and the absence of water. In cases of death by hanging, accordingly, there will probably be a circular livid mark around the neck from the application of the ligature; the face will be turgid with blood and livid; the tongue swollen and projecting, and the mouth frothy. On *dissection,* the appearances will be found the same as in drowning, with the exception that there will be probably more congestion about the head in cases of hanging. There will also be an absence of water in the trachea and bronchiæ, and not unfrequently, the vertebræ of the neck will be dislocated or fractured.

Strangulation and smothering. Death by strangulation is produced by the same general cause as hanging, and the only difference between them, will be the absence of the distinct circular mark round the neck in the former, and the presence of ecchymoses and discolourations about the neck and chest, produced by the application of fingers and nails to these parts.

When the child has been *smothered* under bed-clothes, &c. the circumstances upon which to form a decision that wilful murder has been committed, besides those which characterize strangulation generally, are, the place where the body is found, and the absence of any other probable cause to which its death can be attributed.

Introducing articles into the mouth, nostrils, or throat. When this is the case, dissection alone can detect the cause.

Causing a child to inhale air deprived of its oxygen. This takes place when a living child is shut up in a tight box or coffin. The oxygen of the air contained in the box is gradually consumed, until the air becomes irrespirable. On this subject, Dr. Paris makes the following statement. "Infants appear to be less able to sustain the deprivation of oxygen than adults, and in some cases on record, life has been destroyed by circumstances that we should have *a priori* considered as hardly adequate to such an effect. A case is related of a child who was suffocated by some drunken men having repeately blown out a candle, and held the smoking wick under its nose. The faculty of Leipsic investigated the circumstances, and declared the death to have taken place in consequence of suffocation.*

Signs. In cases of this kind, experiments upon the lungs will show whether the child was born alive or not. If born alive, the absence of any other cause of death, and the suspicious and unnatural circumstances attending the place where the child may be found, will lead to a judgment in the case.

The inhalation of gases positively deleterious. The gas yielded by privies and sewers is sulphuretted hydrogen, and in the smallest quantity, and even when diluted with atmospheric air, proves very speedily destructive of life. When new born infants are thrown into these places, they are destroyed partly by the action of the gas, and partly by ordinary suffocation.

6. *Poisoning.* Poisons may be introduced into the system in various ways. They may be inhaled into the lungs, in the form of odours; or they may be taken into the stomach, mixed with food; or they may be received in the form of injections, or be absorbed through the skin.

When the poisonous substance has been taken into the stomach and intestines, it should be carefully examined, and subjected to the various tests which chemistry supplies for detecting its presence. In cases where the cutaneous absorbents have been the medium of conveying it into the system, it may

* Medical Jurisprudence. By Paris and Fonblanque, vol 2, p. 55.

be very difficult, generally, to discover the cause of death. In some instances, an eruption on the skin, and the peculiar odour of the substance which has been employed, aided by the circumstantial evidence, may lead to a discovery.

Accidental modes in which a child's life may be lost after delivery.

Having thus considered the various criminal modes resorted to for the purpose of destroying the life of the new-born infant, I come now to notice the various causes whichmay destroy it, without any criminal agency. Under this head, there are three different classes of causes, which require notice—*accidental circumstances occurring, either during or immediately after delivery; various malformations inconsistent with the continuance of life, after birth; and various diseases which may have commenced anterior to birth.*

1. *Various causes connected with delivery, which may occasion the death of a new-born child, unconnected with any criminal intention.*

A new-born child may sometimes lose its life, from its not being removed from that state of supination, in which it sometimes comes into the world. In this way respiration may be effectually prevented, by the mouth of the child being closely applied to the bed clothes, or other substances in its way. Dr. W. Hunter relates an instance of a child dying, from its face lying in a pool made by the uterine discharges, where not the least suspicion of any evil design appears to have been attached to the mother.* A case in some respects similar, occurred to myself. A woman, whom I had engaged to attend in her lying-in, was suddenly taken with labour pains, rather before the time the event was anticipated. I was sent for shortly after, but before I reached the house, she had been delivered of a male child, which I found lying dead under the bedclothes. The mother informed me that the child had been born about half an hour, and that she had heard it cry, but as she was alone, she had been unable to give it any assistance.

* Observations on the uncertainty of the signs of murder in the case of bastard children. (Medical Observations and Inquiries, of London, vol. 6.)

Not the slightest suspicion of any criminal intention could for a single moment be cherished. The woman was married, and had engaged me to attend her some weeks before the event took place.

A new-born child may lose its life from the suddenness and rapidity of the labour. Dr. Hunter relates a case, where a female was seized during the night, and the child was born before he arrived. She held herself in one posture, to prevent the child from being stifled; but although it had cried, yet on the arrival of Dr. Hunter it was found dead.* A case is recorded by Mr. Tatham, where a patient in her fourth pregnancy, after three trifling pains, was passing along the lobby to her bed room, when the infant was suddenly thrown on the floor, bleeding profusely at the umbilicus, but ultimately recovered.† Another case is related by the same authority, of a female, who, in the last month of her first pregnancy, while the family were absent, was obliged to go to the night chair—a great discharge of water took place, followed by twin children, which dropped into the utensil; from which, however, they were speedily rescued, but died within a week.‡

Besides this, the labour may be attended with faintings or convulsions of the mother, so as to render her incompetent to offer any assistance to the child.§ With regard to the fact of the death of the child occurring from the mere rapidity and suddenness of the labour, it must be exceedingly rare, and it must be under very peculiar circumstances, and when it does occur, it must be either from the child being suffocated by falling into a privy at the time of delivery, or by the injury which it receives from falling in cases where a female might be delivered while standing. The first of these is, no doubt, possible, and probably has occurred.‖ How improbable the

* Medical Observations and Inquiries, of London, vol. 6, p. 286.

† Medical Repository, for April, 1829.

‡ Campbell's Midwifery, p. 155.

§ Beck's Medical Jurisprudence, vol. 1, p. 156. First edition.

‖ Dr. John Gordon Smith relates, that "a woman was tried at the Old Bailey for the murder of her child, by dropping it into a privy. She declared, that while there for a natural purpose, an uncommon pain took her, the child fell, and she sat sometime before she was able to stir. On this occasion, a practitioner was examined on the probability of such an event, who stated that an instance came within his knowledge, where, while the midwife was playing at cards in the room, the woman was taken

second is, the following facts collected by Dr. Klein of Stutgardt, will show. As a member of the superior council of health, he caused a circular to be addressed to the accoucheurs of the kingdom of Wirtemberg, requesting reports of the cases of sudden expulsion of the fœtus, which might be observed by them. Returns were made of one hundred and eighty three cases. Of these, one hundred and fifty five children were expelled while the mothers were in the upright posture, twenty-two when sitting, and six when on the knees. Twenty-one happened at the first labour. Of the whole number not one child died; no fracture of the bones took place, nor any severe injury. Two only suffered temporary insensibility, and one an external wound with ecchymosis over the right parietal bone.*

Accidental hæmorrhage from the umbilical cord. I have already spoken of neglecting to tie the cord with a criminal intent. It should be recollected that although it has been resorted to with the latter object in view, yet in many, perhaps in most cases, it may be the result of ignorance. It should not be forgotten, too, that this is most likely to occur in those very cases which become the subject of judicial inquiry, inasmuch as in those cases, the female, for obvious reasons, is frequently shut out from the benefit of professional assistance. Besides this, hæmorrhage from the umbilical cord, may occur under a variety of other circumstances, purely accidental. In some cases, it may occur accidentally, from a proper ligature not being applied to the cord. Dr. Hosack states, that he once delivered a woman of a very strong and large child, the cord of which he tied with common tape, as that was the only material at hand. He had scarcely reached his home before he was sent for again, and on returning, found that the ligature had given way, and a dangerous hæmorrhage had en-

suddenly and the child dropped on the floor." Dr. Smith adds, "it recently happened in the circle of my own acquaintance, that a lady who had borne several children, and must therefore have been alive to the import of uneasiness in the last hours of pregnancy, was sitting in company at dinner, and perfectly free from any consciousness of approaching labour, when she experienced an inclination to repair to the water closet. She had scarcely got there when she was delivered of a child. Had the place of retirement been constructed differently," adds Dr. S. "this infant might have perished." (Principles of Forensic Medicine, p. 381–2.)

* Arrowsmith in the Cyclopædia of Practical Medicine, vol. 2, p. 693.

sued.* Mr. Burns states also, that it has "sometimes been found, that when the ligature had become slack, a considerable quantity of blood was lost, and even fatal hæmorrhage has taken place."† Sometimes the cord is very thick, in consequence of a very large quantity of glutinous matter being contained in it. When this is the case, the ordinary ligatures will not be able to prevent bleeding. After the cord is divided, it becomes lessened in size, and the ligature which at first was tight, will now be found loose, and the mouths of the umbilical vessels open. Mr. Radford, who has noticed this especially, relates a case of this kind, in which he was called to an infant who was bleeding, about three hours after birth. The skin was pallid, and the pulse scarcely perceptible. On examination, the ligature was loose, and the orifices widely gaping.‡ Another case of this kind is related by Burns.§ Sometimes the cord will be found ossified, or in a state of cartilaginous hardness. In these cases, there is always more or less danger of hæmorrhage from the inability of applying the ligature properly. A case of this kind, is related by Mr. Logan, in which the cord gave way several times, from pressure of the ligature and from pulling on it during the expulsion of the placenta.‖ Dr. Dewees relates another case, in which a dangerous hæmorrhage took place in a child three days old, and which, on examination, was found to be owing to a varicose state of the cord. In consequence of which, he lays down a general rule, never to apply a ligature above a varicose portion of the cord, if it be possible to apply one below.¶

There is another accident, too, which sometimes happens, in which hæmorrhage may occur; and that is, where the child is suddenly expelled, and the cord ruptured, when perhaps no immediate assistance is at hand. Mr. Custance relates a case of protracted labour, where the child was suddenly expelled *on the bed*, with such violence as to rupture it very near the

* MSS. Lectures.

† Midwifery, p. 565.

‡ Edinburgh Medical and Surgical Journal, vol, 38, p. 2.

§ Midwifery, p. 200, American edition.

‖ Edinburgh Medical and Surgical Journal, vol. 37, p. 276.

¶ A Treatise on the Physical and Medical Treatment of children, by Wm. P. Dewees, M. D. &c. p. 331.

body. Although there was no hæmorrhage, it died in a few hours.* Another case is related by Mr. Chamberlayne, in which the cord broke off (just in the right place too) in consequence of the violent expulsion of the child.† In cases of this kind, however, where the cord is torn off, it is to be recollected that hæmorrhage is not so likely to occur as when it is cut.

A child may die from prematurely tying the umbilical cord. We know that the circulation by the cord and respiration, are vicarious functions, and if one be interrupted or destroyed before the other is in operation, life must cease. It is accordingly laid down as a rule by practical writers, that the cord should never be tied or divided, until respiration has been perfectly established.

That the neglect of this important rule of practice is a frequent cause of death to the new born infant, in the hands of ignorant midwives and practitioners, does not admit of a doubt. Dr. Dewees states, that he has seen "several instances of death, and this of a painful and protracted kind, from the premature application of the ligature.‡ By Dr. Eberle a case is recorded, which illustrates the evil effects of premature tying of the cord. The child breathed freely as soon as it was born. After waiting three or four minutes, until the cord pulsated feebly, it was tied. As soon as the ligature was drawn, the breathing became catching, irregular, and in a few moments almost wholly suspended, and the lips acquired a deep livid hue. The cord was immediately divided below the ligature, but only a few drops of blood could be obtained from it, and it was only with the greatest difficulty that the action of the heart and lungs were re-established.§ Dr. Campbell records a similar case, in which the application of the ligature was followed by breathlessness and lividity of countenance. The child was relieved by the application of two leeches to the region of the heart.‖

* Lancet, vol. 5, p. 120-1.

† London Medical and Surgical Journal, vol. 7, p. 284.

‡ A Treatise on the physical and medical treatment of children, by Dr. W. P. Dewees, M.D. p. 260.

§ A Treatise on the diseases and physical education of children, by John Eberle, M.D. p. 86. Second edition.

‖ Midwifery, p. 152.

2. *Congenital malformations of certain organs.*

These are by no means uncommon, and as they might be found in cases which become the subjects of judicial investigation, and give rise to doubts as to the cause of death, it is necessary to show to what extent they may interfere with the continuance of life in the new-born infant. The subject is one of great interest as well as extent, and all I can hope to do, is to give a general outline of it. Observation has shown, that almost every organ and part of the human body is liable to some malformation or imperfection. It is evident, however, that they cannot all be equally dangerous, or hostile to the prolongation of life. In these respects they must differ greatly according to the degree in which they exist, and more especially according to the importance of the organ in which they are found.

Malformations of the heart and vascular system. Of these the following have been observed and recorded.

A congenital opening between the two ventricles. Several instances of this kind are on record. Dr. Hunter relates the case of a still-born child at six months, who had a hole in the septum of the two ventricles, large enough to allow a goose quill to pass through it.* Another similar case is related by Dr. Pulteney. In this instance, the person lived to nearly fourteen years of age.†

Corvisart gives the case of a child twelve years old, in whom, on dissection, there was found an aperture in the septum of the ventricles, large enough to admit the extremity of the little finger. From the appearance of the aperture, there was good reason for believing that it was congenital.‡

Dr. Hunter relates the case of a patient who reached his thirteenth year, in whom, on dissection, the pulmonary artery was found very small, and an opening of the size of the thumb led from the right into the left ventricle. This patient had been in ill health since his birth—had been subject to fits

* Baillie's Morbid Anatomy, p. 24. Medical Observations, vol. 6.

† Medical Transactions, vol. 3.

‡ Corvisart, p. 207; also p. 229.

from his earliest years, during which his complexion became of a dusky hue. He died in one of these paroxysms.*

Where the heart consists only of one auricle and one ventricle. This is a rare malformation. Mr. Burns says there is only one case on record, and that is by Mr. Wilson. This was in a child who died seven days old, and whose body was brought to the Theatre of Windmill-street for dissection. In this case there was one vessel which originated from the ventricle and divided into two branches—the one to the lungs, and the other to the rest of the body.†

Another case, however, is recorded by Billard. This child lived fifteen days. During this period it was affected with cyanose—had frequent syncopes and fits of threatened suffocation, in one of which it died.‡ This malformation would seem to be inconsistent with the long continuance of life.

Where the aorta arises from both ventricles. Corvisart gives a case from Sandifort, in which the subject died at the age of twelve years. During this period, it had from its second year been attacked with all the symptoms denoting disease of the heart, of which it died. On dissection, it was found, that beside the existence of the foramen ovale and dilatation of the right ventricle, the aorta, instead of rising from the left ventricle only, had a mouth in each of the ventricles.§

In two cases recorded by Mr. Burns, the persons led a most miserable life, and were subject on every trivial exertion to those paroxysms which are produced by a mixture of venous and arterial blood. At last they died dropsical.‖

Another case is recorded by Dr. Ray, of Eastport, in the state of Maine. The child lived to the age of thirteen months. During the first five months of its life, nothing peculiar was perceived about it but a slight blueness of the ends of the fingers, the eye lids, root of the nose and mouth—after this it suffered occasional paroxysms, resembling severe colic, at-

* Observations on some of the most frequent and important diseases of the heart, &c. By Allan Burns, p. 20. Baillie, p. 23.

† Ibid. p. 27.

‡ Traité des Maladies des Enfans, &c. Par C. M. Billard, p. 701, 2d edition.

§ Corvisart, p. 231-2. American edition.

‖ Burns' Observations, p. 13.

tended with a dry suffocative cough. In the intervals of the paroxysms, the child appeared to be perfectly well. On dissection, the ascending aorta and arch was found dilated to four times the capacity of the descending portion. The foramen ovale was open, and both ventricles communicated with the aorta, the aorta being placed astride the two ventricles. The ductus arteriosus was also open and terminating in a cul de sac in the wall of the left ventricle—no pulmonary artery could be discovered.*

Where the pulmonary artery is impervious at its origin. This is by no means common. A case, however, is related by Dr. Hunter, which terminated fatally on the thirteenth day.†

Malformations of the respiratory organs. These, although not very common, are sometimes met with. Cases are recorded in which the thoracic parietes have been so deficient and imperfect, as to leave the heart and lungs naked. Under such circumstances, it is evident that life cannot long be protracted. In some cases, the thorax may be distorted in such way as to interfere greatly with the due expansion of the lungs, and of course with the proper performance of the function of respiration. It is clear, however, that this may exist to a very considerable extent, and yet life be continued for a number of years.

Where a congenital deficiency exists in the *diaphragm*, so as to admit the passage of some portion of the abdominal viscera into the cavity of the thorax, the danger is more impending, and it is hardly possible that life can be long continued.

Malformations of the alimentary canal. These have been observed in every portion of this tract, from the mouth to the anus. The mouth has sometimes been found wanting, or obliterated; in other cases, there has been an absence of the œsophagus. An instance of this kind is reported by Dr. Sonderland. The child at birth was apparently well formed, but rejected every thing that was introduced into its mouth in the way of nourishment. It died on the eighth day. On dissec-

* The Medical Magazine, conducted by A. L. Pierson, J. B. Flint and E. Bartlett, Boston, vol. 2, p. 317.

† Burns' Observations, etc. p. 25.

tion, the cardiac orifice of the stomach was found wanting, and this part of the stomach was adhering to the diaphragm. The œsophagus was entirely wanting, and the pharynx terminated in a cul-de-sac.*

The *stomach* is subject to malformations as regards shape and displacements. These, however, do not interfere with the continuance of life, provided the orifices of this organ be free.

Malformations of the *intestinal canal* are numerous and various. Those which are particularly worthy of notice in this connexion, are those in which the canal is obliterated, or interrupted, or contracted. Dr. Schæfer relates the case of a child, which died on the seventh day after birth. On dissection, the *duodenum* was found terminating in a cul-de-sac, and a complete interruption thus existed in the intestinal canal. This child, during its life, had passed neither meconium nor urine, and vomited matter of a liquid brown character.† Another case, of a similar character, is reported by Billard. In this case, the child died on the third day. It had not passed any meconium, and had vomited freely a yellowish fluid.‡

The most common of these malformations, however, are those of the *rectum*. In some cases, there is simply a contraction and closure of the anus; in other cases, the rectum itself is partly deficient, and terminates in a cul-de-sac; while in others again, the rectum terminates in the bladder, or in the vagina.§ Now, in all these cases, the life of the child must be lost inevitably in a very few days, unless the difficulty can be relieved by an operation.

3. *Various diseases, which may be either congenital, or occur immediately after birth.*

This is the last class of causes to which the death of a newborn infant may be attributed, and which requires to be accurately discriminated from the effects of criminal violence.

Morbus cæruleus. Cyanosis. This is commonly known by the name of the *blue disease*, from the peculiar colour of the

* Billard, p. 285. † Ibid. p. 363. ‡ Ibid. p. 364.
§ Billard, pp. 367, 370. Baillie's Morb. Anat. p. 114. Campbell's Mid. p. 571.

skin which characterizes this affection. The part more particularly affected, is the face. During crying or any other effort on the part of the child, the colour becomes much deeper. Besides the peculiar colour of the skin, the symptoms are, disordered circulation, disturbed respiration, and diminished temperature of the whole body. Now and then the symptoms are all aggravated, and the patient is attacked with the most distressing paroxysms of laborious breathing, fainting, palpitation, and suffocation. It is during these paroxysms that life is generally in danger, and frequently is lost. Concerning the causes of this curious affection, there is some difference of opinion. Formerly it was supposed to be invariably owing to the foramen ovale remaining open. This, however, is not the case, inasmuch as it has been found to be associated with a number of malformations of the heart and large bloodvessels.*

From what has been already stated in relation to these malformations, it is easy to appreciate the kind of danger to which a new-born infant is subject, in whom they may be found to exist. While in some cases death may take place in a few hours or days after birth, in others again existence has been protracted for many years. As, however, life is always in danger in these cases, the just and certainly humane conclusion in a case of alleged infanticide, and where this disease might be urged as the cause of death, would be to admit that it might be so, provided said malformations were actually found on dissection, and provided no other cause of death could be detected.

Organic diseases of the heart and bloodvessels. By Billard, a case is recorded of a child, who, from birth, was affected with frequent syncope, difficult breathing, discoloration of the nostrils and lips, and disordered circulation. It died, after suffering in this way about two months. On dissection, the heart was found almost as large as a hen's egg, with dilatation of the right auricle and ventricle.†

Another curious and unique case is recorded by the same

* For a condensed, but excellent view of this subject, see a Dictionary of Practical Medicine, by *James Copland*, M. D. vol. 1, p. 199. American edition.

† Billard, p. 589.

author, of a child who had an *aneurism of the ductus arteriosus*. It died on the fourth day, and betrayed no symptoms during life of the existence of this aneurism. It was about the size of a cherry pit.*

Pericarditis. By Billard, this disease is supposed to be more common in new-born infants, than at any other period of life. In seven hundred autopsic examinations which he made at the Foundling Hospital of Paris, he found seven well marked cases of pericarditis; two of these were in children who died on the second day after birth. In one, an infant of two days old, he found the adhesions of the pericardium so solid as to lead to the belief that the disease was of long standing, and must have commenced while the fœtus was still in utero.†

Pneumonia and pleuritis. There is every reason to believe that these affections, though rare, may sometimes exist in the fœtal state. Billard states, that in three infants who died on the first day after birth, he found the texture of the lungs so altered, as to lead to the belief that it must have commenced antecedent to birth. In two cases, the left lung was hepatized at its base.‡ In these cases, there was no doubt that this condition of the lungs interfered with the establishment of respiration, and was the cause of death.

Inflammation of the *larynx* has not been observed as occurring in the fœtal state. Billard, however, states that he has frequently observed in fœtuses born before the time, a congestion of blood about these parts. The mucous membrane of the larynx and trachea was of a violet colour, and at the same time there was an extravasation of blood extending even into the bronchiæ. He presumes there must have been in these cases a great determination of blood to those parts in the last moments of intra-uterine life, or during the act of delivery.§

With regard to affections of the lungs, it is also to be recollected, that infants are occasionally liable to be attacked with many of them immediately after birth, and they may prove fatal in a few days. In all cases of this kind, however, the appearances on dissection will throw light upon the cause of death.

* Billard, p. 591.
† Ibid. pp. 595, 703.
‡ Billard, p. 521.
§ Ibid. p. 494.

Diseases of the alimentary canal. Billard states that in two cases in which new-born infants died a short time after birth, he found ulcerations in the œsophagus, which from their appearance must have been developed during intra-uterine life, and which, from the progress they made after birth, must have hastened their death.*

The same author relates cases in which there was every reason to believe that *inflammation of the stomach* existed previous to birth, and was the cause of death after birth.†

Ramollissement of the intestines has also been noticed by Billard, in children who have died a short time after birth.‡

Having thus ascertained that the child was born alive, and that its death was owing to violence, we are next to inquire into the relations of the child with the supposed mother. As already stated, the questions here to be investigated are the following.

1. Has the woman been actually delivered? The signs of delivery have already been discussed in a previous part of this essay.

2. Do the signs of delivery in the mother correspond as to time, &c., with the appearance of the child?

The great object of this inquiry is, to determine the length of time which has intervened between the birth of the child and its death, with the view of comparing this with the signs of delivery in the reputed mother. This is to be done by examining the following points:

(*a.*) The state of the foramen ovale.
(*b.*) The state of the ductus arteriosus.
(*c.*) The state of the ductus venosus.
(*d.*) The state of the umbilical cord.
(*e.*) Whether putrefaction has yet commenced.

By comparing these observations with the signs observed on the female, a rational opinion can easily be formed, whether any incongruity exists between them, and the inference of course is obvious.

* Billard, p. 637. † Ibid. p. 311, 689. ‡ p. 691.

Circumstantial evidence. Although this does not strictly appertain to a medical discussion of the subject, yet there are some points embraced under it, concerning which the testimony of the physician may be required.

1. It may be urged in excuse for a woman on a trial for child murder, that from the uncertainty of the signs of pregnancy, she may have been ignorant of her actual condition, and therefore may have been suddenly overtaken with the pains of labour, when it was out of her power to command assistance, and thus the child have lost its life. To all this, a very plain and concise reply may be made. However difficult it may be for a physician to say positively, whether a woman is pregnant or not, yet we can scarcely suppose the woman herself to entertain much doubt on the subject, especially in a first pregnancy, which it almost always is in cases of infanticide. If she has yielded to the solicitations of a seducer, and if she afterwards experiences those changes and developements in her system, which accompany a state of impregnation, she cannot but be conscious of her true situation, and therefore, any arguments drawn from this source ought to have no weight.

2. It may be suggested in vindication of the woman, that the delivery was so rapid that it was out of her power to procure assistance, or make the necessary preparations for preserving the child's life. In cases of first pregnancy and delivery, it is not very probable that the labour would be accomplished so speedily. The necessary dilatation of the parts would require a length of time sufficient to give her proper warning of the impending event. In succeeding labours, it is possible that it might occur. Dr. Wm. Hunter relates a case of this kind, which occurred in his own practice.* The physician should, therefore, always inquire if this be a first child, or if she has had others previously. Other circumstances relating to the delivery should also be investigated. It is not impossible that a woman may be delivered while standing, and the child have fallen upon the floor, and thus its death have

* Observations on the uncertainty of the signs of murder in the case of bastard children. Medical Observations and Inquiries, vol. 6.

been occasioned.* Such cases are, however, extremely rare, and should be admitted with great caution. In speaking of the accidental causes of the death of the child, I have already noticed this subject.

3. It may be urged in the defence of a female accused of destroying her child, that she may have been labouring under puerperal mania; in other words that she was insane. A case of this kind appears actually to have occurred, and is related by Dr. Paris. "In the year 1668, at Aylesbury, a married woman of good reputation being delivered of a child, and not having slept many nights, fell into a temporary phrenzy, and killed her infant in the absence of any company; but company coming in, she told them she had killed her infant, and *there* it lay; she was brought to jail presently, and after some sleep she recovered her understanding, but marvelled how or why she came thither. She was indicted for murder, and upon her trial the whole matter appearing, it was left to the jury with this direction, that if it did appear that she had any use of reason when she did it, they were to find her guilty; but if they found her under a phrenzy, though by reason of her late delivery and want of sleep, they should acquit her; that had there been any occasion to move her to this fact, as to hide her shame, which is ordinarily the case of such as are delivered of bastard children and destroy them; or if there had been jealousy of the husband that the child had been none of his; or if she had hid the infant, or denied the fact, these had been evidences that the phrenzy had been counterfeit. But none of these appearing, and the honesty and virtuous deportment of the woman in her health being known to the jury, and many circumstances of insanity appearing, the jury found her not guilty, to the satisfaction of all who heard it."† On this case Dr. Paris justly remarks, "had this woman been of doubtful character, though innocent, she might have been

* Lafosse once saw in a hospital a woman, who, feeling the first pains of labour, imagined that they arose from a different cause, and rose to go to stool. Half of the infant was immediately born, but happily there was sufficient time to receive it and prevent its fall.

† 1 Hale's Pleas of the Crown, p. 36.

executed for want of medical evidence to prove the nature and frequency of puerperal insanity."*

Of the method of conducting examinations in cases of infanticide.

In every case of infanticide, so much depends upon the testimony furnished by the physician, that it becomes a sacred duty on his part to investigate, with the utmost fidelity and impartiality, every circumstance which may aid him in coming to a satisfactory and enlightened decision. The labour of such investigation is doubtless great and unpleasant; but unless submitted to by the professional witness, he certainly cannot be considered as qualified to give his evidence in a case which involves the life of a fellow being.

External examination of the child. This should embrace the following particulars:

(*a.*) Every thing relating to its external appearance, shape, conformation, condition as to putrefaction, spots, ecchymosis, &c.

(*b.*) Its size, including not merely the size of the whole body as to length, but the dimensions of the head and of the thorax.

(*c.*) Its weight.

(*d.*) The condition of the umbilical cord.

Internal examination. This should include,

1. The condition of the respiratory organs:

(*a.*) The dimensions and shape of the thorax.

(*b.*) The situation of the diaphragm.

(*c.*) The colour of the lungs.

(*d.*) Their volume.

(*e.*) Their shape.

(*f.*) Their situation.

(*g.*) Their consistence or density.

(*h.*) Their absolute weight.

(*i.*) Their specific weight.

* Paris and Fonblanque's Medical Jurisprudence, vol. 3, p. 129–30.

2. The condition of the organs of circulation:

(*a.*) The foramen ovale.

(*b.*) The ductus arteriosus; its dimensions and shape.

(*c.*) The ductus venosus.

(*d.*) The state of the umbilical vessels.

3. The condition of the abdominal organs:

(*a.*) The liver; its weight.

(*b.*) The stomach and intestines; particularly the large intestines, with a view of ascertaining the presence or absence of the meconium.

(*c.*) The state of the urinary bladder.

4. The condition of the brain and spinal marrow.

Mode of conducting the dissection of a child.

It will be found most convenient to commence the dissection with the mouth and the cavities leading to the chest. An incision should first be made from the under lip to the top of the sternum, and another along the lower edge of the inferior maxillary bone; after which, the integuments are to be dissected back. The lower jaw is then to be divided at its symphysis, and the two portions separated. By bending the head back, we shall now be able to obtain a complete view of the cavity of the mouth. The position of the tongue should now be examined. If any foreign matters are found in the mouth, they should be especially observed and noted. In short, every unnatural appearance, whether morbid or artificial, should be carefully investigated and recorded.

The larynx and trachea must next be laid open. If any fluid is found, it should be specially examined.

So much of the œsophagus as can now be seen, is also to be examined.

The abdomen is next to be examined. The first incision is to be continued down to the lower part of the sternum, and from this point, an incision made through the integuments to the spine of the ilium on each side. The triangular flap thus made, is then to be turned down, and the umbilical vessels to be examined and tied. The diaphragm is to be observed, whether it be much arched towards the thorax or otherwise.

The viscera of the abdomen are next to be inspected, and every thing peculiar in their appearance or condition to be noticed. The ductus venosus should be examined, whether it be pervious, and contain any blood. After tying the vessels leading to the liver, it should be taken out and weighed. The whole of the intestinal canal, with the stomach, should be taken out, after having tied the two ends. The contents of the stomach are to be critically investigated. If there is any suspicion of poison, the ordinary tests for ascertaining it should be resorted to. The state of the gall bladder and urinary bladder should be inquired into, whether they be empty or not. Lastly, it should be seen whether there be any meconium in the intestinal canal.

In opening the thorax, the ribs and sternum must be divided in the ordinary manner; and in doing this, a scissors will be found a much more safe and convenient instrument than a scalpel. Having exposed the thorax to view, the general appearance, position and colour of the lungs are to be remarked.

The trachea is now to be divided as near as possible to the lungs. The aorta and venæ cavæ are to be tied and cut beyond the ligatures. The lungs should then be taken out and weighed, and after this, subjected to the experiments already detailed in a previous page. The heart is next to be examined, and it should be particularly noted whether the auricles and ventricles are filled with blood; the state of the ductus arteriosus should be ascertained; and lastly, whether the foramen ovale be still open. As the death of an infant may not unfrequently be caused by injury inflicted on the spine, it becomes necessary to examine this part also. A longitudinal incision should be made from the occiput to the sacrum—the muscles to be separated and turned back. By means of strong scissors, the vertebræ are then to be divided on each side. The posterior part of the spine thus separated, may easily be removed, and the whole canal exposed for examination.

In opening the head an incision should be made from the lower part of the frontal bone down to the second or third cervical vertebra, and another at right angles to this from ear to ear. By dissecting back the integuments thus divided, the

cranium will be completely exposed. The cranium should now be carefully examined, to see if there be any fractures, punctures, wounds, &c. The bones are next to be removed, and the most convenient method of doing this will be to separate them by a scissors along their membranous connexion with each other. Great care should be taken not to occasion any laceration during the dissection.

The substance of the brain must be carefully investigated, and every deviation from the natural and healthy state observed. Although this examination of the brain can throw no light upon the question whether a child has been born alive, yet it may aid us materially in detecting the cause of its death.

Having completed the dissection, the inferences to be drawn from the information thus obtained, must be obvious. They have been so fully explained in the former part of this chapter as to render unnecessary any recapitulation.

This completes the examination of the child.

Examination of the mother. The business of the physician, however, does not end here—he must also investigate the condition of the reputed mother. And the points to be ascertained here, as we have already stated, are—

1. Whether she has been recently delivered.

2. Whether the signs of the delivery correspond with the appearances detected on examination of the child.

ILLUSTRATIONS OF EXAMINATIONS AND REPORTS.

1. *Report proving the crime of infanticide.**

We the undersigned, doctors of medicine or surgery, of the faculty of ——, inhabitants of the town or parish of ——, canton of ——, arrondisement of ——, department of ——, upon the requisition of ——, made known to us by Mr. N. bailiff, went there this —— day of the month of ——, year ——, hour ——, with Messrs. N. N., in the house of ——, situated in the street of ——, No. ——, story ——, room ——, to visit there the corpse of a child of the —— sex, which had been found in the morning under a heap of

* This report is taken from Capuron's Médecine Légale, p. 494.

dirt, in the yard of the said house, and to ascertain the cause of its death.

Arrived in the house and room designated, they presented to us the said body, wrapped in coarse rags of woollen stuff much worn, and moth-eaten.

After having stripped it, we observed that there was attached to the umbilicus, a portion of the umbilical cord, still fresh, without any ligature, and about five inches in length, of which the open extremity was very visibly unequal and fringed; which convinced us that the cord had been broken or torn by force.

The said body was still covered over with the unctuous and whitish substance that almost all children have at their birth; this substance was mixed, in some places, principally on the head, shoulders and buttocks, with dust and blood.

To enable us to examine the said body with care, we had it washed and carefully dried. We observed afterwards that it was large, fat, well formed, exempt from putrefaction and fetor. Its whole length was nearly twenty inches, and its weight about seven pounds.

The whole of the surface of the trunk was soft and of a pale colour, except on the back, where we remarked an ecchymosis or violet stain, unequally circumscribed and oblong, about three and a half inches in length, and two inches in width, which did not extend beyond the adipose tissue—of which we assured ourselves by dissection.

The flesh of the limbs was soft, and all the joints flexible; the left elbow and the thumb of the corresponding hand slightly excoriated, as well as the external part of the knee, and the heel of the same side.

The face was of a livid colour, the right cheek of a very deep brown, and deeply infiltrated with blood, of which we assured ourselves by two incisions; the eyelid, the eye, the forehead and the temple of the side, were ecchymosed and blackish.

The skull was very soft on the right side, changed its form by the slightest pressure, and sank down when it was placed on the opposite side. The skin on the temporal region of the right side, from the top to the neck, and from the forehead

to the occiput, was brownish; and through this skin could be distinguished, by the fingers, the fluctuation of a fluid which seemed to have separated it from the bones. We convinced ourselves, by means of an incision, that it was an effusion of blood, partly coagulated, which extended over all the parietal bone, and upon the squamous portion of the temporal bone. The first of these two bones, in its middle and superior part, was entirely detached from the neighbouring bones, as well as from the pericranium, and from the dura mater. It was also fractured in two places and in two ways, viz. directly from the third superior of its anterior edge to the corresponding point of its posterior edge, and obliquely from the parietal swelling to the temporal bone. This last bone was equally broken in its superior edge, and its articulation with the lower jaw was so altered that we could neither distinguish its form or structure.

The other parts of the body presented no appearance of lesion externally. We observed, only on the left side of the chest, at a half inch from the sternum, between the second and third rib, a small round wound, half a line in diameter. A similar wound existed on the left side of the neck and immediately above the shoulder. But neither penetrated beyond the skin, as we proved by dissection.

On opening of the head, we found the right lobe of the brain covered with blood, and completely disorganized; it had no longer its natural form, structure or consistence. We found also at the basis of the skull, about two ounces of serum.

On opening the chest, we perceived no defect of conformation in the organs; the heart and the large vessels were gorged with blood, the lungs developed and of a rose colour. After having detached, wiped and weighed these last organs, we placed them in water; at first entire, afterwards by pieces, which we pressed hard in a linen, and they swam equally in both cases.

On opening the abdomen, the viscera presented no alteration nor deformity; the large intestine was filled with meconium, and the bladder contained a little urine.

After all these observations, we conclude and declare that

the child, whose body we examined, was of full term, strong and well made; which is attested by its volume, weight, dimensions, and its exterior conformation.

That it was born alive, which is proved by the ecchymosis and infiltration of the face, as well as by the effusion of blood below the integuments of the skull.

That it has completely respired, as we proved in examining the state of the lungs, and in placing them in water, when they completely floated.

That it died shortly after its birth; which is also proved by the adhesion of a portion of the umbilical cord to the umbilicus; by the unctuous and whitish substance with which the skin was covered, and by the meconium with which the large intestine was filled.

That it had not been long dead; which is proved by the absence of fetor and of every mark of putrefaction; by the softness and freshness of the flesh, and by the flexibility of the joints.

That the death of the child could not be the effect, either of a hæmorrhage by the umbilical cord; which is proved by the engorgement of the heart and of the large vessels;—nor of suffocation; which is proved by the absence of any alteration in the chest and lungs;—nor of any natural or ordinary cause, which is proved by the marks of violence impressed on the head and face, which attest on the contrary a violent death; —nor of a fall on the skull, where we observed fractures of which the situation, the form, the number and direction, prevent us attributing it to this cause.

Finally, that the death of this child is the effect of blows or external violence, given a short time after its birth, on the right side of the head and of the face; the only cause to which we could attribute the fractures of the skull, the effusion of blood in this cavity and the disorganization of the brain.

In testimony of which, we have drawn up the present report, which we closed at the house of ——— in presence of ———, and which we certify to be correct.

Made ——— day, month and year.

Signed.

2. *Report on a case of infanticide in consequence of omitting to tie the umbilical cord.**

I, the undersigned, doctor in medicine, and physician of the Hospital of Trevoux, report, that in consequence of a request from the magistrate to go to the commune of ———, to visit the body of a new-born child, which the mayor of that commune declared that he would not permit to be buried, until the cause of its death had been proved, I repaired to said commune on the 5th of November, 1811, and made inquiries of the female in whose possession I found the body of the child. In reply to my interrogatories, she stated that she had received the said child the day before, at five leagues distance from that place, in a clandestine manner from M. * * * enveloped in a strong covering, and with an order to depart instantly. That during her journey, not hearing it cry, she put it to the breast; she found, however, that it scarcely breathed and would not suck, and on her arrival with it, in spite of all her care, the child was dead. On examining the child's clothes, she found them all bloody, and the blood appeared to come from the umbilical cord. After this information, I proceeded to examine the body of the child, and found it to be a male, seventeen inches long and only four pounds in weight, having its nails and hair like a child at the full time. The skin, both of the face and of the whole body was of the colour of white wax—the lips were of the same colour, instead of being rosy — the limbs were flaccid and pliable, and the lower part of the belly very projecting. On examining carefully the whole surface of the body and all the external cavities, no trace of violence of any kind could be discovered. The state of the umbilical cord, however, struck me particularly. It had a ligature upon it, but so loose that the handle of a bistoury could be run between the cord and the ligature. On measuring the cord I found it cut off clean at three inches from the umbilicus. I now proceeded to open the chest. The lungs and heart were such as they ordinarily are in children who have respired, but of a very pale colour. Having detached the viscera for the purpose of making experiments on the lungs,

* Manuel de Médecine Légale, par Briand, p. 314.

the following things were observed: 1. In separating the heart and lungs from the chest, not a single drop of blood was perceived, nor was there any during the dissection. 2. The lungs pressed between the hands and cut with a knife, crepitated throughout their whole extent. They were also perfectly healthy. 3. On putting the heart and lungs connected together in a bucket of water at the temperature of 10° Reaumur, the whole floated perfectly. 4. The quantity of blood found in the heart and large bloodvessels after having opened them, was only two ounces. The cavity of the abdomen and its contents were then examined, but presented nothing peculiar, with this exception, that the liver was much paler than common, and the large vessels dissected and followed up even to the extremity of the cord, contained not a drop of blood. The urinary bladder and the intestines were found empty; the first of urine and the second of meconium.

From these various observations, I draw the following conclusions: 1. That the child in question was born at the full term, alive, and in a sound state. 2. That it must have performed a great number of full and complete respirations, and that it must have lived several hours. 3. That it did not receive any violence, properly so called, such as blows, contusions, &c., which could have caused its death. 4. That its death was the result of hæmorrhage from the umbilical cord, and that it is probable that the flat string which loosely surrounded the extremity of the cord, was placed there as a ligature, after life had already been entirely extinguished by the hæmorrhage.

3. *Report of a case of recent delivery.**

We the undersigned, professors of the faculty of medicine, &c. ——, at the request of the commissary of police of the division of Luxembourg, went with him this day, (Sunday,) 12th November, 1809, at 10 o'clock in the morning, to a house occupied by Mc. Catharine Tillard, for the purpose of visiting her daughter Nanette Tillard, who was supposed to have been delivered of a child on Thursday morning the 9th of this month, and to give evidence concerning her situation.

* Considerations sur l'Infanticide, par Lecieux. p. 68.

We found the said Nanette Tillard in bed, and from the examination which she underwent, we made the following observations.

1. Her face was somewhat pale; her eye heavy, and slightly discoloured.

2. Her pulse was febrile, full and fluctuating; the skin was soft and pliable, a little heated, and with a moisture on it, which had the acid odour which is peculiar to women in childbed.

3. The breasts were tumid and painful; milk had already issued from the nipple, as we convinced ourselves by examining the stains on the linen of the patient: moreover, in squeezing the breast gently, we expressed a milky fluid well marked by its colour and consistence.

4. The abdomen was soft; the skin was loose, wrinkled, covered with little shining reddish, whitish lines, crossing each other in different directions, running chiefly from the region of the groins and of the pubis to the umbilicus; a brownish line was also visible, running from the pubis to the umbilicus, and we perceived that the median line of the abdominal muscles had experienced considerable extension, as was ascertained by the irregularity of its course in running the end of the finger over it, especially on the side towards the umbilical region; finally, through the parietes of the abdomen, we felt the body of the womb, which was voluminous, hard and round, at a little distance from the umbilicus, and contracted itself very distinctly under the hand while pressing it.

5. A whitish fluid, mixed with blood, issued from the genital organs, which had the colour and the strong odour peculiar to parturition, as we convinced ourselves by examining the linen under the patient.

6. The genital organs were slightly tumefied, and very much dilated in their whole extent; the orifice of the womb was relaxed and soft; it gave passage to the bloody whitish fluid just mentioned; it was so pliable, and so much dilated, that we could easily have introduced several fingers.

7. Finally, we found by examination that the pelvis was large, wide, and well constructed for an easy delivery.

From these different observations, we affirm,

1. That Nanette Tillard had been delivered three or four days at the farthest, which is satisfactorily proved by the condition of the breasts, the secretion of the milk in them, the smell of the perspiration, the nature of the discharge from the genital organs, the state of the womb, of the abdomen, and of the genital organs.

2. That no disease or affection other than delivery, could produce all these effects combined, which we have observed.

3. That from the formation of the pelvis, Nanette Tillard could be delivered easily and promptly.

PART III.

Of Infanticide in its relations to medical police, including a history of legislation on the subject, and an examination of the effects of foundling hospitals.

Infanticide, which at one period prevailed so universally and without restraint among the most polished nations of the world, is now considered, in all enlightened countries, as a crime of the deepest dye. Mankind, on this subject, have vibrated from one extreme to the other; and it is not to be questioned, but that in the present day, many an innocent female is wantonly sacrified to suspicion and prejudice. The *principle*, however, which now guides the moral judgment of society on this subject, is undoubtedly just; for it is a crime which presupposes the obliteration of those feelings which human nature ought to be most proud of, and which, if countenanced, or but slightly punished, would lead to the most dreadful consequences.

That a young female of character and reputable connexions, and possessed of tender sensibility, may have been betrayed by the arts of a base seducer, and when reduced to a state of pregnancy, to avoid the disgrace which must otherwise be her lot, may stifle the birth in the womb, or after it is born, in a state of frenzy, imbrue her hands in her infant's blood, in the expectation of throwing the mantle of oblivion over her crime, is a case which too frequently occurs; but even such a case, with all its palliations, cannot be considered as less than wilful murder, and as such demands exemplary punishment.

It is not, however, enough for a wise legislation merely to punish crimes after they are perpetrated; it should also adopt the most effectual means of preventing their commission altogether. In the language of a philosopher, it may be said, that "the punishment of a crime cannot be just, if the laws have not endeavoured to prevent that crime by the best means which times and circumstances would allow."*

With regard to infanticide, it is impossible to suggest any method of arresting it completely, unless there be a total reformation of that corruption of manners which lies at the root of the evil. Next to this, the dread of severe punishment is the most effectual preventive. Foundling hospitals were also founded with this intent; whether they have this tendency, I shall consider presently, after having enumerated the laws enacted by different nations for the purpose of preventing and punishing this crime.

1. *Laws against criminal abortion or fœticide.*

Although the Jewish code specified nothing relative to criminal abortion, or to the murder of the new-born infant, yet it decreed, that if a pregnant woman should be *accidentally* injured in a fray between two men, so that she proved abortive, without any injury to her own person, the punishment was a fine, such "as the judges might determine." If the woman received any personal damage, the law of retaliation was then to operate — an eye for an eye, and a tooth for a tooth, &c. If she lost her life, death was the punishment.†

After the Romans began to consider the procuring of abortion as a crime, they denounced punishments against the authors of it. These, as has been already noticed when considering the animation of the fœtus, varied with the changes that took place in the philosophical sentiments of the nation. In the year 692, a council, convened in the palace of the emperor at Constantinople, ordained that it should be punished with the same severity as homicide.‡

In *France*, the Roman law was adopted, and practised upon

* Beccaria's Essay on Crimes and Punishments, p. 101. New-York edition.

† Exodus, chap. xxi. v. 22, 23.

‡ Foderé, vol. 4, p. 383.

until the revolution. Their parliaments frequently condemned midwives to be hanged, for procuring abortion in girls; and physicians, surgeons, and others guilty of this crime, were subjected to the same punishment.* The French code of 1791, commuted the punishment to twenty year's imprisonment in chains. The penal code of the empire, adopted by Napoleon in 1810, contains the following provisions against this crime: "Every person who, by means of aliments, beverages, medicines, acts of violence, or by any other means, shall procure the untimely delivery of a pregnant woman, although with her consent, shall be sentenced to *confinement*, (reclusion.")

"The same punishment shall be inflicted upon the mother who shall make use of such means, if they are followed by abortion."

"Physicians, surgeons, apothecaries, and other officers of health, who shall prescribe or administer such means of abortion, shall, if a miscarriage ensue, be sentenced to hard labour for a limited time."†

The criminal code of *Austria*, established in 1787, by Joseph II. in which the punishment of death is totally abolished, decrees, that a woman with child, using means to procure abortion, shall be punished with imprisonment for not less than fifteen, nor more than thirty years, and condemnation to the public works; augmented, when married."

"Accomplices advising and recommending abortion—imprisonment not less than one month, nor more than five years, and condemnation to the public works. The punishment to be increased, when the accomplice is the father of the infant."‡

"The laws of Germany punish with from two to six years' imprisonment, a woman (or her aiders, &c.) who, by potions or other means, shall have wilfully produced abortion, within the first thirty weeks from the time of conception; and the penalty is protracted to eight, or at the utmost to ten

* Foderé, vol. 4, p. 348.

† Article 317. For a translation of the whole code, see Walsh's American Review, vol. 2.

‡ Treatise on the Police of London, by P. Colquhoun, LL. D. 7th edition, p. 656.

years, when such a crime has been committed within the last month of pregnancy.

The laws of Bavaria enact similar measures.

In the Italian code it is established, "that if a woman has used means, with the intent to produce abortion, and this shall *not* have taken place, she is to be punished by imprisonment, for a period of from six months to one year; but if abortion has been the consequence of such means, the imprisonment is to be of from one to five year's duration. The same penalties, but with exacerbations, are enacted against the father of the fœtus, if he has been an accomplice in the crime. Finally, the delinquent who, against the will of the mother, shall have caused abortion, or have made an attempt to cause her abortion, is to be punished by from one to five years' severe imprisonment; and if the life of the mother has thereby been brought into danger, or her health injured, the duration of the penalty shall be from five to ten years."*

The English law is thus stated by Blackstone. "If a woman is quick with child, and, by a potion or otherwise, killeth it in her womb, or if any one beat her, whereby the child dieth in her body, and she is delivered of a dead child, this, though not murder, was by the ancient law *homicide*, or manslaughter. But the modern law doth not look upon this offence in quite so atrocious a light, but merely as a heinous misdemeanour."† "But if the child be born alive, and afterwards die in consequence of the potion or beating, it will be *murder*."‡ By a subsequent law, enacted in 1803, called the Ellenborough act, it was ordained, that "if any person shall wilfully and maliciously administer to, or cause to be administered to, or take any medicine, drug, or other substance or thing whatsoever, or use, or cause to be used or employed, any instrument, &c., with intent to procure the miscarriage of any woman, *not being*, or not being *proved* to be *quick* with child at the time of committing such thing, or using such means, then, and in every such case, the person so offending, their counsellors, aiders and abettors, shall be, and are de-

* London Medical and Physical Journal, vol. 43, p. 96.

† Blackstone's Commentaries, vol. 1, p. 129.

‡ Ibid. Note by Christian.

clared guilty of felony, and shall be liable to be fined, imprisoned, set in and upon the pillory, publicly or privately whipped, or transported beyond the sea for any term not exceeding fourteen years."* The same act ordains, that administering medicines, drugs, &c., with the intent to procure abortion *after quickening*, shall be punishable with death.

On examining these provisions, it will be seen that there was a striking omission in the English law, against the procuring of abortion, *after a woman is quick* with child. The statute prescribed death as the punishment for administering any noxious or destructive substance, with an intent to destroy the child, and yet inflicted no punishment when the same was actually procured by mechanical violence. This defect of the statute was illustrated in a trial (already alluded to in a previous part of this essay) which took place in England, in 1808. One Pizzy, a farrier, and another person, (a female,) were indicted for administering a noxious and destructive substance to one Ann Cheney, with intent to produce miscarriage. It was proved by the deposition of Cheney herself, that repeatedly during her pregnancy she had taken medicines from the accused without producing any effect, and finally, that a few days before her delivery, he took her up stairs alone, and introduced an instrument into her body. This was repeated, as the first attempt had not succeeded, and accordingly after the last one, she had never felt the child move. The jury, however, acquitted the prisoners, expressing themselves not fully satisfied with the evidence, to convict. On the trial, the counsel for the prisoner even objected to receiving that part of the evidence which related to his manual operations, as not relevant to the administration of the medicines, which alone constituted the capital crime ; and the criminal was tried for giving medicine which had no effect, while the actual perpetration of the crime by mechanical violence, could only be noticed in court as proving the intention with which the medicines were given.† By a late statute, however, (9 George IV. chap. 31, passed 27th June, 1828,) and entitled " An act for consolidating and amending the statutes in England relative

* Statutes at Large, 43 George III. cap. 28. Male's Medical Jurisprudence, p. 114.
† Edinburgh Medical and Surgical Journal, vol. 6, p. 244.

to offences against the person," this omission is provided for, and the whole law is recast. It now stands thus, "If any person, with intent to procure the miscarriage of any woman then being quick with child, unlawfully and maliciously shall administer to her, or cause to be taken by her any poison or other noxious thing, or shall use any instrument or other means whatever with the like intent, every such offender and every person counselling, aiding or abetting such offender, shall be guilty of felony and shall suffer death as a felon; and if any person with intent to procure the miscarriage of any woman, not being, or not being proved to be, then quick with child, unlawfully and maliciously shall administer to her, or cause to be taken by her, any medicine or other thing, or shall use any instrument or other means whatever with the like intent, every such offender and every person counselling, aiding, or abetting such offender, shall be guilty of felony, and being convicted thereof, shall be liable to be transported for any term not exceeding fourteen years, nor less than seven years, or to be imprisoned, with or without hard labour, in the common jail or house of correction, for any term not exceeding three years, and if a male, to be once, twice, or thrice, publicly or privately whipped, (if the court shall so think fit,) in addition to such imprisonment."

The *Law of Scotland*, on this subject, appears to differ. Mr. Hume, in his Commentaries on the Criminal Law of Scotland, says, that all procuring of abortion, or destruction of future birth, whether quick or not, is excluded from the idea of murder, because, though it be quick, still it is only *pars viscerum matris*, and not a separate being of which it can with certainty be said, whether it would have become a quick birth or not. Since Mr. Hume wrote, a case occurred in the High Court of Justiciary, where the subject was discussed. A surgeon and midwife, indicted for the violent procuring of abortion, were convicted and sent to Botany Bay for fourteen years.*

Mr. Alison, one of the latest writers on Scotch law, states it to be as follows: "If a person gives a potion to a woman

* Edinburgh Medical and Surgical Journal, vol. 6, p. 249.

to procure abortion, and she die in consequence, this will be murder in the person giving, if the potion given was of that powerful kind, which evidently puts the woman's life at hazard." And again—"administering drugs to procure abortion is an offence at common law, and that equally whether the desired effects be produced or not." Thus cases occurred in 1806 and 1823, where persons were sentenced to transportation for using instruments to procure it; and in 1824, another was condemned to the same punishment, for administering arsenic with a like design.*

In the state of New-York, the following are at present the laws. The first quoted have reference to the death of the mother, or the unborn quick child; the last, to the procuring of abortion.

"Every person who shall administer to any woman pregnant with a quick child, any medicine, drug, or substance whatever, or shall use or employ any instrument or other means, with intent thereby to destroy such child, unless the same shall have been necessary to preserve the life of such mother, or shall have been advised by two physicians to be necessary for such purpose, shall, in case the death of such child or of such mother be thereby produced, be deemed guilty of manslaughter in the second degree.

"The wilful killing of an unborn quick child, by any injury to the mother of such child, which would be murder if it resulted in the death of such mother, shall be deemed manslaughter in the first degree."†

The punishment for manslaughter, first degree, is imprisonment in the State prison for a term not less than ten years; for the second degree, not less than four and not more than seven years.

"Every person who shall wilfully administer to any pregnant woman, any medicine, drug, substance or thing whatever, or shall use or employ any instrument, or other means whatever, with intent thereby to procure the miscarriage of such woman, unless the same shall have been necessary to

* Alison's Principles of the Criminal Law of Scotland, p. 52 and 628.

† Revised Statutes, vol. 2, p. 661. Session Laws of 1830, p. 401.

preserve the life of such woman, or shall have been advised by two physicians to be necessary for that purpose, shall, on conviction, be punished by imprisonment in a county jail, not more than one year, or a fine not more than five hundred dollars, or both."*

In the state of Ohio, the law against abortion is the following: "If any physician or other person, shall administer to any pregnant woman any drug, &c., or shall use any instrument or other means whatever, with intent thereby to procure the miscarriage of such woman, unless the same shall have been necessary to preserve the life of such woman, or shall have been advised by two physicians to be necessary for that purpose, he shall, on conviction, be punished by imprisonment for not more than one year, or by fine not exceeding five hundred dollars, or by both. If the woman be pregnant with a quick child, such person shall, in case of the death of the child or the mother by such means, be imprisoned in the penitentiary, not more than seven years, nor less than one year."†

In the state of Connecticut, the law enacts, that for administering any noxious or destructive substance for the purpose of procuring the miscarriage of a woman quick with child, the punishment, on conviction, shall be imprisonment in Newgate prison during his or her natural life, or for such other term as the court having cognizance of the offence shall determine.‡

In Missouri, the administration of poison with an intent to procure abortion, is punished by imprisonment for a term not exceeding seven years, and a fine not exceeding three thousand dollars.§

2. *Laws against the murder of the new-born infant.*

These, in almost all civilized countries, are capital. Previous to the fourth century, the edicts of the Roman emperors against this crime were partial and ineffectual; towards the latter part of that century, however, it was completely

* Revised Statutes, vol. 2, p. 694.
† American Jurist, vol. 13, p. 211.
‡ Revised Laws of Connecticut, p. 152.
§ Laws of Missouri, 1825, p. 283.

prohibited. The following is the article relating to it in the Cod. Justin. lib. viii, tit. 52, de infant. expositis, 1, 2: "Unusquisque sobolem suam nutriat. Quod si exponendam putaverit, animadversioni quæ constituta est, subjacebit."*

The emperor Charles V. condemned the mother to death only in cases where it could be proved that the child had been born alive.† The Caroline code, (*Constitutio Carolina,*) in such cases ordained, that the guilty person should be tied in a bag with a live cock and a cat, and thrown into a river.‡

The following statement of the laws against infanticide and abortion in the middle ages, is given in the Cabinet Cyclopedia of Dr. Lardner.

Among the Germanic nations of the middle ages, "death was the penalty of infanticide, generally, even at the time of birth; or if the judge spared the midwife, she lost her eyes." Among the Bavarians, there was a singular provision against abortion: "the pecuniary mulct was not only to be paid *annually* by the man who caused the abortion, but annually by his descendants to the seventh generation; for as the child or fœtus had not been baptized, and as its doom was, consequently, everlasting fire, no ordinary penalty should meet such a crime."§ Among the Lombards, "in the twelfth century, we find the Lex Pompeia fully in force.‖ Infanticide was also terribly visited on the wretched mother, who was buried alive, and a stake thrust through her body. Subsequently we find some changes in the mode of punishment, as regarded both parricide and infanticide; sometimes the culprits were dragged by red-hot forceps to the place of execution; but the unnatural mother, even if she were only guilty of producing abortion, was often sewed in a sack, and thrown into a river. In Saxony, even at a late period, a viper, monkey and dog were sewed in the same sack; and at a later period, too, in Siberia and Lusatia, the living grave and stake were in use."¶

* Beckman's History of Inventions, vol. 4, p. 437.

† Foderé, vol. 4, p. 396.

‡ Male, 2d edition, p. 271.

§ Dunham's Europe in the Middle Ages, (Lardner, No. 49,) vol. 2, p. 145.

‖ Cod. Justin, 1, 9, pr. a. ad. Leg. Pomp. de Par.

¶ Dunham, vol. 2, p. 146.

The Frisians allowed the infant to be exposed, or put to death, provided it had not sucked the breast of its mother.*

In 1556, Henry II. of France, made a law condemning to death every woman convicted of having concealed her pregnancy, and put to death a bastard child. This law prevailed until the year 1791,† when every thing relating to the concealment of pregnancy was repealed, and death declared to be the punishment of the murder of the child.

The penal code of the French empire enacted, that "every person guilty of assassination, parricide, *infanticide*, or poisoning, shall suffer death."—Art. 302.

Other articles provide against the exposure and abandonment of infants. "Those who shall expose and abandon in a solitary place, a child under seven years of age, and those who may order it to be exposed, shall, on that account alone, if such order be executed, be imprisoned for a term not less than six months, and not more than two years, and fined from sixteen to two hundred francs."—Art. 349.

And "if, in consequence of such exposition or abandonment, the child shall be mutilated or crippled, the act shall be considered and punished as in the case of wounds voluntarily inflicted; and if the consequence be death, it shall be considered and punished as *murder*."—Art. 351.‡

The *Austrian law* provides, that "exposing a living infant, in order to abandon it to danger and death, or to leave its deliverance to chance, whether the infant so exposed suffers death or not, shall be punished by imprisonment for not less than eight, nor more than twelve years; to be increased under circumstances of aggravation."§

In *Saxony*, infanticide is punished with the same severity as parricide; the culprit is put into a bag, with a dog, a cat, a cock and a serpent, and then thrown into the water.‖

Although the *Chinese* have no law prohibiting the exposure of children, yet they inflict a slight punishment for the wanton murder of them. The following is the law on that subject:

* Dunham, vol. 2, p. 146, 206.
† Foderé, vol. 4, p. 365.
‡ American Review, vol. 2, p. 396.
§ Colquhoun, p. 66.
‖ Specimen Juridicum, etc. p. 44.

"If a father, mother, paternal grandfather or grandmother, chastises a disobedient child in a severe and uncustomary manner, so that he or she dies, the party so offending shall be punished with one hundred blows.*

The *English law* on this subject has, within a few years, been materially changed.

By the Stat. 21, Jac. I. c. 27, it is enacted, that "if any woman be delivered of any issue of her body, which being born alive, should by the laws of this realm be a bastard; and that she endeavour privately, either by drowning or secret burying thereof, or any other way, either by herself or the procuring of others, so to conceal the death thereof, as that it may not come to light whether it were born alive or not, but be concealed: in every such case, the said mother so offending, shall suffer death as in the case of murder, except she can prove by one witness at the least, that the child whose death was by her so intended to be concealed, was born dead."†

Upon this statute, Blackstone remarks, "This law, which savours pretty strongly of severity, in making the concealment of the death almost conclusive evidence of the child being murdered by the mother, is, nevertheless, to be also met with in the criminal codes of many other nations of Europe, as the *Danes*, the *Swedes*, and the *French*."‡

This cruel law has since been mitigated. In 1803, an act was passed in that country, which decrees, that "women tried for the murder of bastard children, are to be tried by the same rules of evidence and presumption as by law are allowed to take place in other trials of murder: if *acquitted*, and it shall appear on evidence that the prisoner was delivered of a child, which by law would, if born alive, be a *bastard*, and that she did, by secret burying or otherwise, endeavour to conceal the birth thereof, thereupon it shall be lawful for such court, before which such prisoner shall have been tried,

* La Tsing Leu Lee; being the fundamental laws, and a selection from the supplementary statutes of the penal code of China. By Sir George Staunton, F.R.S. (Quarterly Review, vol. 3, p. 312, 13.)

† East's Crown Law, vol. 1, p. 228.

‡ Blackstone's Commentaries, vol. 4, p. 198.

to adjudge, that such person shall be committed to the common gaol, or house of correction, for any time not exceeding two years."

The English law, according to the 9 George IVth. chap. 31, stands at present thus—

"If any woman shall be delivered of a child, and shall by secret burying or otherwise disposing of the dead body of the said child, endeavour to conceal the birth thereof, every such offender shall be guilty of a misdemeanour, and shall be liable to be imprisoned, with or without hard labour, in the common gaol or house of correction, for any term not exceeding two years; and it shall not be necessary to prove whether the child died before, at or after its birth, provided, that if any woman tried for the murder of her child shall be acquitted thereof, it shall be lawful for the jury to find, in case it shall so appear in evidence, that she was delivered of a child, and that she did, by secret burying or otherwise disposing of the dead body of such child, endeavour to conceal the birth thereof, and thereupon, the court may pass such sentence, as if she had been convicted upon an indictment for the concealment of the birth."

In Scotland, "if a woman conceal her pregnancy during the whole period, and shall not call for, or make use of help or assistance in the birth, and if the child shall be found dead or be a missing, she shall be subject to two year's imprisonment."*

In the state of *New-York*, we have no particular law concerning this crime, and as the English statutes are not in force, all trials for infanticide must of course be conducted according to the common law, and accessary circumstances can only be considered as proving the intent.

In *Massachusetts*, the mere concealment of a bastard child is punished with a fine not exceeding £50. For concealing the death, whether the child have been murdered or not, the mother is punished by being set on a gallows with a rope about her neck, for the space of one hour, and is further bound to her good behaviour at the discretion of the court.

* Alison's Principles of the Criminal Law of Scotland, p. 151.

If convicted of the wilful murder of the infant, the crime is murder, and death the punishment.*

In *Vermont*, a law was passed in 1797, punishing with death the murder or concealment of a bastard, if it came to its death by the neglect, violence, or procurement of the mother. This has been repealed, and in the revised laws of that state it is enacted, that if a woman be privately delivered of a bastard, and it be found dead, and if there be presumptive evidence of neglect or violence on the part of the mother, the punishment shall be a fine not exceeding five hundred dollars, and imprisonment not over two years; one or both at the discretion of the court.†

In *Connecticut*, the law determines, that if a woman conceal her pregnancy, and be delivered secretly of a bastard, she shall be punished by a fine of not more than one hundred and fifty dollars, or imprisonment not over three months. For concealing the death of a bastard, so that it may not be known whether it was born alive or not, or whether it was murdered or not, she is set on a gallows with a rope about her neck for one hour, and imprisoned for not more than one year.‡

In *New-Jersey*, the concealment of pregnancy, and delivery in secret, is considered a misdemeanor, and punished by fine and imprisonment. Concealing the death of the bastard, is also punished by fine and imprisonment.§

In *New-Hampshire*, the concealment of the death of a bastard child, is made a crime, and the punishment directed, is imprisonment for not more than two years, or a fine not exceeding one thousand dollars.‖

In *Pennsylvania*, by the act passed in 1781, the concealment of the death of a bastard child, was conclusive evidence to convict the mother. "And all and every person, who shall counsel, advise, or direct, such woman to kill the child she goes with, and after she is delivered of such child, she kills it,

* Laws of Massachusetts, 1807, vol. 1, p. 222.
† Laws of Vermont, 1808, vol. 1, p. 349.
‡ Revised Laws, 1821, p. 152.
§ Digest of the Laws of New-Jersey, 1833, p. 224, 225.
‖ Digest of the Laws of New-Hampshire, 1830, p. 149.

every person so advising and directing, shall be deemed accessary to such murder, and shall have the same punishment as the principal shall have."* This law has since undergone the following alterations. By the act of 5th April, 1790, the constrained presumption that the child, whose death is concealed, was, therefore, murdered by the mother, shall not be sufficient evidence to convict the party indicted, without probable presumptive proof is given that the child was born alive, and that of the 22d of March, 1794, declares, "the concealment of the death of any such child, shall not be conclusive evidence to convict the party indicted of the murder of her child, unless the circumstances attending it be such as shall satisfy the minds of the jury that she did wilfully and maliciously destroy and take away the life of such child."*

In *Rhode-Island*, the law is very similar to that in Pennsylvania.†

In *Delaware*, by a law passed in 1719, the concealment of the death of a bastard child is made a capital offence, except the mother can make proof by one witness at least, that the child whose death was by her so intended to be concealed, was born dead. This, however, was repealed, and I cannot find at present any statute on this subject in the code of that state.‡

In *Georgia and Illinois*, the concealment of the death of an illegitimate child, is punished with imprisonment.§

In *Michigan*, the laws as to the concealment of pregnancy, the delivery of the bastard child, and its death, are the same as those in New-Jersey.‖

3. *Foundling Hospitals.*

Foundling hospitals, by providing for the support of illegitimate children, are generally considered as a great means of preventing child murder. The object of these institutions is

* Remarks on Infanticide by R. E. Griffith, M.D. Chapman's Journal, new series, vol. 4, p. 260. Laws of Pennsylvania, 1803, vol. 5, p. 6. Addison's Reports, p. 1. Pennsylvania *v.* Susannah M'Kee.

† Laws of Rhode-Island, 1798, p. 597.

‡ Laws of Delaware, 1797, vol. 1, p. 67, vol. 2, p. 670.

§ Digest of the Laws of Georgia, 1822, p. 349. Revised Laws of Illinois, 1833, p. 177.

‖ Laws of Michigan, 1820, p. 194.

no doubt commendable, but it is certain that they are not productive of that decided utility which is usually attributed to them. It is not to be denied that some good results from them, but it is by no means commensurate with the abuses to which they give rise. That they encourage illicit commerce between the sexes—discountenance marriage—increase the number of illegitimate children, and consequently the number of exposures—are facts confirmed by the history of almost every foundling hospital that has been established. Mr. Malthus states facts of this kind with regard to the foundling hospital in St. Petersburgh, (Russia.) "To have a child," says he, "was considered as one of the most trifling faults a girl could commit. An English merchant at St. Petersburgh told me, that a Russian girl living in his family, under a mistress who was considered as very strict, had sent six children to the foundling hospital, without the loss of her place."* It is not necessary to enter into a laboured course of reasoning, to prove that the effects of these establishments are decidedly injurious to the moral character of a people. It is a position sufficiently self-evident, and as Malthus justly remarks, "an occasional child murder, from false shame, is saved at a very high price, if it can only be done by the sacrifice of some of the best and most useful feelings of the human heart in a great part of the nation."†

In the language of the Edinburgh Review, "such an establishment (a Foundling Hospital) may safely be termed a great public nuisance, leading to unchaste life and to child-murder, beyond any other invention of the perverted wit of man; for, unless it can receive the fruit of every illicit connexion, which is impossible, it must needs encourage many to enter into such an intercourse, without giving them the means of providing against its consequences."‡

There is, however, another objection to Foundling Hospitals. The history of such establishments proves that they

* Malthus on Population, vol. 1, p. 368-9.

† Malthus on Population, p. 370. For further illlustrations of this fact see a history of the present condition of public charity in France, by David Johnston, M.D. p. 320, 321.

‡ Edinburgh Review, vol. 38, p. 440.

utterly fail of accomplishing their object, which is the preservation of the lives of children. The records of those which have been kept with the greatest care, exhibit the most astonishing mortality.

In Paris, in the year 1790, more than 23,000, and in 1800, about 62,000 children were brought in; and it is estimated, that eleven-thirteenths of all the foundlings perish annually through hunger and neglect.* It is stated also, that vast numbers of the children die from a disease called l'endurcissement du tissue cellulaire, which is only to be met with in the Foundling Hospital.† Of 100 foundlings in the Foundling Hospital at Vienna, 54 died in the year 1789. Subsequent accounts of this hospital, do not represent it in a more favorable light. In a recent description of this institution, it is stated, that "all attempts to rear the children in the hospital itself had failed. In the most favourable years, only 30 children out of the 100 lived to the age of twelve months. In common years, 20 out of the 100 reached that age, and in bad years not even 10. In 1810, 2583 out of 2789 died. In 1811, 2519 out of 2847 died. Like the cavern of Taygetus, this hospital seemed to open its jaws for the destruction of the deserted and illegitimate progeny of Vienna. The emperor Joseph II. frequently visited this hospital in person, and upon one occasion he ordered Professor Boer to make a series of experiments with all kinds of food, that it might be ascertained how far diet had its share in the mortality. Twenty children were selected, and fed with various kinds of paps and soups, but in a few months most of them were dead."‡

In consequence of this extraordinary mortality, "in 1813, the government enacted that the foundling-house should serve merely as a depot for the children, till they could be delivered to the care of nurses in different parts of the country." In 1822, under this new system of nursing in the country, the deaths had diminished from 1 to 2, to 1 to 4½.§

In St. Petersburgh and Moscow, the Foundling Hospitals

* Beckman's History of Inventions, vol. 4, p. 456-7.
† Cross' Medical Sketches of Paris, p. 197.
‡ Quarterly Journal of Foreign Medicine and Surgery, vol. 1, p. 188.
§ Elements of Medical Statistics, by F. Bisset Hawkins, M. D. p. 136.

have always been managed with the greatest liberality and care; and yet, in the latter city, during the twenty years subsequent to 1786, when the hospital was first instituted, of 37,000 children received, 35,000 at least are computed to have died. In 1811, the foundlings admitted into the hospitals appropriated to them, were 2517, and the deaths were 1038. In 1812, 2699 were admitted, and the deaths were 1348. In the province of Archangel, the proportion of deaths has been still greater. Of 417 foundlings admitted in 1812, 377 died the same year.*

In Palermo, during the year 1823, 597 foundlings were received at the hospital in that place, of whom 429 died.†

In the hospital at Metz, calculation showed that seven-eighths of the whole number of children perished. In an institution of this kind in one of the German principalities, only one of the foundlings, in 20 years, attained to manhood.‡

The Foundling Hospital of London, exhibits rather a more favourable picture. The average of those who died there under twelve months, in ten years, was only one in six, and for the last four or five years, even less in proportion.§

The general fact is, however, sufficiently evident, that the lives of the multitudes of children are sacrificed in these hospitals. The causes too are evident. In some instances, it arises from the want of nurses, or the mismanagement and cruelty of those that are employed; in others, from the delicacy of the infant—the want of its mother's nourishment—the vitiation of the air—and the contagious diseases to which children are more peculiarly exposed.

But do foundling hospitals diminish the number of infanticides? We have no evidence of such a result flowing from them. From the deleterious influence which they have upon the moral feelings of the female sex, we cannot believe that it is the case. And it is accordingly stated, that after the Foundling Institution of Cassel was established, not a year

* Elements of Medical Statistics, by F. Bisset Hawkins, M. D. p. 137.

† Ibid, p. 139.

‡ Beckman on Inventions, vol. 4, p. 456–7.

§ Highmore's History of the public charities in and near London, p. 727. Rees' Cyclopedia, Art. Hospital.

elapsed without some children being found murdered in that place or its vicinity.*

The following account of the deaths in the different foundling hospitals of Europe, will afford ample testimony in support of the opinions already advanced. It is taken from the Edinburgh Medical and Surgical Journal, vol. i, p. 321–2.

"In 1751, Sir John Blaquiere stated to the House of Commons of Ireland, that of 19,420 infants admitted into the *Foundling Hospital of Dublin*, during the last ten years, 17,440 were dead or unaccounted for; and that of 2180 admitted during 1790, only 187 were then alive. In 1797, he got a committee of the same house appointed, to inquire into the state and management of that institution. They gave in their report on the 8th of May, 1797; by which it appeared, that within the quarter ending the 24th March last, 540 children were received into the hospital, of whom, in the same space of time, 450 died: that, in the last quarter, the official report of the hospital stated the deaths at three, while the actual number was found to be 203: that, from the 25th of March to the 13th of April, nineteen days, 116 infants were admitted; of which number, there died 112. Within the last six years, there were admitted 12,786; died in that time, 12,651. So that in six years, only 135 children were saved to the public and to the world.

"In the *Charitē of Berlin*, where some enjoyed the advantage of being born in the house, and of being suckled by their mothers six weeks, scarcely a fourth part survived one month.

"Every child born in the *Hotel Dieu* of Paris, was seized with a kind of malignant aphthæ, called *le muguet*, and not one survived who remained in the house.

"At *Grenoble*, of every 100 received, 25 died the first year; at *Lyons*, 36; at *Rochelle*, 50; at *Munich*, 57; and at *Montpellier*, even 60. At *Cassel*, only 10 out of 741 lived 14 years. In *Rouen*, one in 27 reached manhood; but half of these in so miserable a state, that of 108, only two could be added to the useful population. In *Vienna*, notwithstanding the princely income of the hospital, scarcely one in 19 is preserved. In

* Beckman, vol. 4, p. 456.

Petersburgh, under the most admirable management and vigilant attention of the Empress Dowager, 1200 die annually out of 3650 received. In *Moscow*, with every possible advantage, out of 37,607 admitted in the course of 20 years, only 1020 were sent out."

In relation to the general effects of foundling hospitals, a most important work has recently been announced, of which only the prospectus has yet appeared, the following notice of which I take from Silliman's Journal of Science and the Arts. In collecting materials for his work, the author* has travelled over the greater part of Europe. According to this author, it is chiefly in catholic countries that foundling hospitals are found. "Austria has many such institutions; Spain reckons 67; Tuscany, 12; Belgium, 18; but France, in this respect, excels other countries—she has no less than 362. Protestant countries, on the contrary, have suppressed the greater part of those which had been specially founded for this purpose."

To form an idea of the advantage of the protestant system over that of catholic countries, the author states, that "in London, the population of which amounts to 1,250,000, there were, in the five years from 1819 to 1823, only 151 children exposed; and that the number of illegitimate children received in the 44 workhouses of that city, of which he visited a large number in 1825, amounted, during the same period, to 4668, or 933 per annum; and that about one-fifth of these are supported at the expense of their fathers. By a striking contrast, Paris, which has but two-thirds of the population of London, enumerated, in the same five years, 25,277 enfans trouvés, all supported at the expense of the state."

To ascertain the contagious influence of these houses on the abandonment of new-born children, Mayence had no establishment of this kind, and from 1799 to 1811, there were exposed there 30 children. Napoleon, who imagined that in multiplying foundling hospitals, he would multiply soldiers and sailors, opened one in that town on the 7th November, 1811, which remained until March, 1815, when it was suppressed by the Grand Duke of Hesse-Darmstadt. During this period of three

* M. De Gouroff, Rector of the University of St.Petersburgh, Counsellor of State, &c.

years and four months, the house received 516 foundlings. Once suppressed, as the habit of exposure had not become rooted in the people, order was again restored; and in the nine succeeding years, but seven children were exposed.*

List of British and American Cases and Trials for Infanticide.

1. *William Pizzy* and *Mary Codd*, tried at *Bury St. Edmunds*, 1808, for feloniously administering a certain noxious and destructive substance to *Ann Cheney*, with intent to produce miscarriage. In this case, the abortion was perfected, not by the medicine, but by the subsequent introduction of an instrument into the uterus. (1)

2. *Charles Angus*, indicted and tried at Lancaster, 1808, for the murder of *Margaret Burns*, of Liverpool. In this case, the prisoner was charged with endeavouring to procure an abortion, by means of an instrument, and also by the administration of drugs, which terminated in the death of the female. This is a most important and interesting case, well worthy of being studied. (2)

3. The case of *Phillips*, tried in January 1811, for attempting to procure abortion in *Hannah Mary Goldsmith*, by giving savine. (3)

4. The case of *Robin Collins*, tried at Chelmsford assizes, 1820, for administering steel filings and pennyroyal water, with the intent to procure abortion. (4)

5. The case of *Margaret Tinckler*, indicted at Durham in 1781, for the murder of *Janet Parkinson*, by having inserted wooden skewers into the uterus, for the purpose of producing abortion. (5)

6. *Sarah Hill*, for infanticide. (6)

7. *Mary Eastwood*, for infanticide. (7)

8. Case in *Scotland*, for infanticide. (8)

9. *Sarah Little*, for infanticide, reported by P. J. Martin, surgeon. (9)

10. *Bease* and *Elliot*. Infanticide. (10)

11. *Margaret Patterson*. A case of infanticide, examined and reported by David Scott, M.D. of Cupar-Fife, Scotland, accompanied with remarks

* American Journal of Science and the Arts, vol. 17, p. 393.

(1) Edinburgh Medical and Surgical Journal, vol. 6, p. 244.

(2) See Annual Medical Register for 1808, vol. 1, p. 143. Edinburgh Medical and Surgical Journal, vol. 5, p. 220. A Vindication of the opinions delivered in evidence by the medical witnesses for the Crown, on a late trial at Lancaster for murder, pp. 88. An able pamphlet written by John Rutter, M.D. of Liverpool. Paris & Fonblanque, vol. 2, p. 176. A full account of this case is also given in the Elements of Medical Jurisprudence, in the chapter on *Delivery*, by T. R. Beck, M.D.

(3) Paris and Fonblanque, vol. 3, p. 86.

(4) Ibid. vol. 3, p. 88.

(5) Paris and Fonblanque, vol. 3, p. 72. Principles of Forensic Medicine, by J. Gordon Smith, M.D. p. 326. East's Pleas of the Crown, Tit. *Murder*.

(6) Edinburgh Medical and Surgical Journal, vol. 11, p. 77.

(7) Ibid. vol. 11, p. 78.

(8) Ibid. vol. 21, p. 231.

(9) Ibid. vol. 25, p. 34.

(10) Ibid. vol. 35, p. 456.

by Professor Christison of Edinburgh. This is a highly interesting case, and altogether the best reported one in the English language. (11)

12. Case of alleged infanticide at Aberdeen, 1804. The child died from inability on the part of the mother to aid it after birth. (12)

13. Case of infanticide at Aylesbury, in 1668. The woman murdered her child in a state of temporary insanity, and was acquitted on that ground. (13)

14. *Mary Baker*, reported by Dr. Robinson of Bridport, England, for infanticide. (14)

15. Case of infanticide, reported by W. Chamberlaine, surgeon in London. (15)

16. Case of infanticide, reported by Mr. F. H. Ramsbotham. (16)

17. A woman indicted and tried for infanticide, at the Sussex assizes, England, 1825, (17)

18. *Eliza Maria Jones*, for infanticide. Reported by Prof. Amos. (18)

19. A case in London, of infanticide. (19)

20. *Susanna Powell*. Trial for infanticide at Schenectady, State of New-York, in 1810. (20)

21. A trial for infanticide, October 1831, in Jefferson county, Ohio, before the supreme court. Reported by John Andrews, M.D. (21)

22. Trial of *Hannah Hall*, for murdering her illegitimate child, in the county of Chester, Penn. in 1833. Reported by Isaac Thomas, M.D. (22)

(11) Edinburgh Medical and Surgical Journal, vol. 26, p. 62.

(12) Paris and Fonblanque, vol. 3, p. 126, taken from Burnett's Treatise on the Criminal Law of Scotland.

(13) Paris and Fonblanque, vol. 3, p. 129.

(14) London Medical Repository, vol. 22, p. 346.

(15) London Medical and Physical Journal, vol. 7, p. 283.

(16) London Medical Repository, vol. 21, p. 344. Godman's Journal of Foreign Medicine and Surgery, vol. 4, p. 532.

(17) Johnson's Medico-Chirurgical Review, vol. 9, p. 239.

(18) London Medical Gazette, vol. 10, p. 375.

(19) Lancet, vol. 9, p. 339.

(20) Report of the trial of Susanna, a coloured woman, before the Hon. Ambrose Spencer, esquire, at a court of oyer and terminer, held at Schenectady, 23d October, 1810, on a charge of having murdered her infant bastard male child. By Henry W. Warner. 1810.

(21) American Journal of Medical Sciences, vol. 9, p. 257.

(22) Ibid. vol. 13, p. 565.

II.

ON ACUTE LARYNGITIS.

It is only very recently that inflammation of the larynx has become the subject of any special inquiry; and by many, it has been supposed that it was a disease wholly unknown until within a few years past. This supposition is, however, by no means probable. Being a disease of simple inflammation, there can be no doubt that it must have occurred, occasionally at least, from the earliest periods; and a review of their writings will convince us that it did not escape the attention of observing men even in the infancy of medical science. For the purpose of establishing this fact, as well as of facilitating the inquiries of those who may hereafter be tempted to the investigation of this interesting subject, I shall enter upon a few historical details.

Hippocrates appears to allude very distinctly to this disease in his book of Prognostics. He says, "those anginas are very dangerous and speedily fatal, which produce no sensible change in the fauces or in the throat, which cause great pain, and induce orthopnœa. They produce suffocation on the first, second, third, or fourth day."* I am aware, that a writer of no common authority, Sir Gilbert Blane, has given it as his opinion that the disease here referred to is more probably the croup, because no mention is made of difficult deglutition.† This cannot, however, be justly considered as any solid objection to the supposition of the disease being laryngitis. It should be recollected, that it was not the object of the great father of medicine to give us in his "Prognostics," minute and detailed descriptions of diseases. He

* The Prognostics and Crises of Hippocrates, translated from the Greek, &c. By H. W. Ducachet, M. D., &c. p. 68.

† Medico-Chirurgical Transactions of London vol. VI. p. 143.

presents us with those great and prominent features only, from which a judgment may be formed concerning the general character and the final issue of diseases; and hence it will be found, that in more instances than one, some of the most distinctive symptoms are not at all brought into view. Illustrations of this might be adduced in abundance. It is unnecessary, however, to go beyond the very subject of which we are speaking for one perfectly satisfactory. In the aphorism succeeding the one just quoted, Hippocrates speaks of anginas accompanied with pain, tumour, and redness, and adds, that they are very fatal. Now, it is evident, that in these cases deglutition must be very greatly impeded, and yet no mention is made of this circumstance. The omission, therefore, of any notice of difficulty of deglutition, a symptom common to all the anginas, cannot be admitted as of any great weight in determining this question. As to the conjecture, that the disease alluded to by Hippocrates is croup, upon the very principle assumed by Sir Gilbert Blane, it is attended with even greater difficulties than the one to which he opposes it, inasmuch as nothing is said concerning cough, a symptom so characteristic of croup as to distinguish it from every other affection.

Cœlius Aurelianus, in treating of the various kinds of cynanche, describes one, which, if it does not answer in every respect to our ideas of laryngitis, yet resembles it more closely than any other disease. He represents it as unattended by any evident tumour or inflammation of the fauces, and as destroying life more speedily by strangulation than any of the other forms of this affection. "At si sine manifesto tumore fuerit passio, sequitur collorum tenuitas, cum extentione, atque subrectione inflexibili. Item vultus et oculorum cavitas: frontis extentio, color plumbeus, spirationis difficultas plurima, nullo, ut supra diximus, manifesto tumore, sive inflammatione aliqua apparente, neque in internis, neque in externis partibus, hebetudo plurima, atque imbecillitas ægrotantis; et celerrimus, vel acutus cum præfocatione, mortis effectus."*

* De morbis acutis et chronicis, &c. lib. iii. cap. 2, p. 182, Amstelœdami, 1722.

By Celsus this species of angina is also distinctly recognised, when he says: "Interdum enim neque rubor, neque tumor ullus apparet," &c.* And afterwards, in noticing the symptoms which are common to this as well as to the form of angina attended with tumour, he adds: "Illis communia sunt; æger non cibum devorare, non potionem potest, spiritus ejus intercluditur. Levius est, ubi tumor tantummodo et rubor est, cætera non sequuntur."†

Under the head of "Angina Interna," this disease is unquestionably described by Tulpius. "Varia sunt anginæ genera, sed nullum perniciosius illo quod produxit, vel vertebra introrsum luxata; vel inflammatio musculorum interioris laryngis. Quorum profundus tumor, si quidem coarctet angustum, asperæ arteriæ, caput; et ligulam illi insculptam (quæ sunt proxima vocis instrumenta) supprimitur non tantum vox; vel præcluditur quoque via spiritui; vel potius ipsi vitæ. Quæ sine spiritu nulli diu, durabilis. Ac proinde non inconsiderate, Hippoc. lib. iii. prog. 'latens angina vel primo, vel secundo die, lethalis.'"

He then adds the following case:

"Nauta pleni habitus, correptus intempesta nocte, ab urgente faucium angustia, traxit ilico spiritum adeo difficulter ut excitata febre, et accenso gutture, inciderit protinus in grave suspirium, spiritum turbidum, imo ipsam mortem. Cujus periculo, quo subtraharetur, nihil non molitum: sed urgentior fuit necessitas; et vehementior, ab incluso spiritu, strangulatus: quam ut juverint ipsum, vel sanguis maturè ex utroque brachio detractus, vel incisa ranula: vel cucurbitulæ, gargarisationes, clysteres, cataplasmata: aliaque satis celeriter adhibita."‡

Riverius in his Praxis Medica, under the head of Angina, has left us what was no doubt intended as a description of this disease. In speaking of one of the varieties of angina, he says: "In cynanche maxima est respirationis læsio, ita ut ægri strangulari videantur, et paucis etiam horis aliquando strangulantur; ac non nisi erecta cervice, et aperto ore spirare

* Aurel. Cornel. Celsi de medicina. lib. iv. cap. iv. p. 196. Lugduni Batavorum, 1746.
† Ibid.
‡ Nicolai Tulpii observationes medicæ, lib. i. cap. 51, p. 93. Amstelœdami, 1672.

valeant. Fauces vehementer dolent, nullus tamen rubor aut tumor, neque in faucibus intus neque extra in cervice apparet."*

Morgagni, in his great work on the "Seats and causes of Diseases," has furnished us with a history of the symptoms and morbid appearances, on dissection, of an unequivocal case of this disease.†

By Lommius a most admirable description has been given us of a species of angina, the identity of which with laryngitis can hardly be mistaken. "Porro mortifera est, atque omnium horrendissima angina, citissime, que incidit, et necat, quæ neque in cervice, neque in faucibus quicquam conspicui, vel tumoris, vel ruboris exhibet, simulque summi doloris tormentum, et vehementem febrem, atque tantum non presentem suffocationem infert. Tum profecto oculi vertuntur, et rubent, et veluti iis qui strangulantur, prominent: vox impedita nihil significat, et qualis catulorum est, tenuis editur: os apertum hiat: frigidi æris cupidum, ex eoque spumans saliva movetur: lingua exeritur, crebroque, ut in anhelis propter laboris impetum equis, agitatur; potui datus liquor per nares remeat: labra livescunt: cervices rigidæ contractæque sunt: ipse æger totus inquietus est, crebro e cubili exilit, moleste supra dorsum, commodius recto collo atque capite cubat; videt, auditque obtuse, et præ suffocatione non intelligit quid audiat, quid dicat, aut gerat: tandem vero strangulatu, atque syncope oppressus, perit."‡

By Boerhaave this disease is described in a manner that must convince every person that he was not unacquainted with its nature. "If the larynx," says he, "chiefly be acutely inflamed, and the seat of this evil be in the white muscle of the glottis, and together in the fleshy muscles, whose office it is to shut the same; there ariseth a terrible quinsey, which soon strangles. The signs are, a violent pain in the raising of the larynx, upon swallowing, increased upon speaking or hallooing; a very shrill and shrieking voice; a very

* Lazari Rivirii, opera omnia universa. Praxis Medica, lib. vi. cap. 7, p. 93. Lugduni, 1663.

† Epist. xliv. 3.—Cooke's Morgagni, vol. I. p. 221, Am. ed.

‡ J. Lommii observationes, p. 99. Amstelœdami, 1738.

hasty death, with the utmost anguish; and this is the worst kind of all, and not discernable by any outward signs."* In the treatment, he recommends copious and repeated blood-letting, purging, blisters, inhalation of warm vapors, and finally, bronchotomy.

Lieutaud divides anginas into four species: the inflammatory, catarrhal, gangrenous, and spasmodic. The last of these he thus defines: "Convulsive angina varies much from the other species of angina, both in the greater difficulty of breathing, and in swallowing being more impeded, so that even when erect, the patient can scarcely draw breath, while, from accurate examination, there appears no mark of redness, obstruction, or swelling about the parts affected. Such is the violence of this disease, that it takes off some patients in a few hours."†

Mead, also, in his medical precepts, gives an account of this disease as a species of quinsey, which he calls a *strangulation of the fauces.* In this affection, he says, "all the nerves are convulsed, and the patient drops down dead suddenly. Of this sort (of quinsey) I have seen one instance, in which, though a large quantity of blood was drawn twice in six hours' time, yet that evacuation was of no avail. Upon dissection, there was not even the least appearance of swelling or inflammation in the glands or muscles of the mouth and throat; but the blood vessels were turgid every where with a thick blood. This disease, however rare," he adds, "is described by Hippocrates."‡

Although it appears evident from the foregoing review that this disease is very far from being of such recent origin as some have supposed, and also that, under the generic term of angina, it has been described by a number of successive writers, yet it must be admitted, that it is only within a few years that its true nature and distinguishing features have been investigated with that accuracy and precision to which its great importance so justly entitle it. That this was not

* Aphorisms, 802, 809.

† Synopsis of the universal practice of medicine, &c. p. 465, translated by E. A. Atlee, M. D.

‡ Medical precepts and cautions, by Richard Mead, M. D. &c. p. 71.

accomplished, by the ancients more particularly, is to be attributed entirely to the want of those anatomical investigations after death, which in later times have thrown such a flood of light over pathological inquiries.

In 1809, three cases of this disease were reported by Dr. Matthew Baillie to a society in London for the improvement of medical and chirurgical knowledge, and were published in their transactions in 1812. The whole paper is exceedingly interesting, and furnishes a fine specimen of that accuracy of observation and maturity of judgment which so eminently characterized that distinguished physician.* It is a fact worthy of remark in connexion with this paper, that Dr. Baillie states, that after a practice of more than twenty years, he had only met with two cases of the disease, and that he knew many physicians, of much longer experience, who had never met with even a single case.

In the same year in which the foregoing paper was published, appeared an account of some cases of this disease in the Medico-Chirurgical Transactions of London,† by Dr. Farre; and to this physician perhaps are we most indebted for awakening the attention of medical practitioners to this important subject. Since that time, several valuable contributions of cases and observations have appeared in relation to it, in the succeeding volumes of the Transactions of that Society,‡ as also in the periodical publications of Britain.§ A brief notice is also taken of it by Dr. Marshall Hall,‖ in his treatise on diagnosis; and in the works of Armstrong,¶ Bell,** and Bedingfield,†† will be found many important facts and observations in relation to it.

In France, the disease was briefly but accurately noticed in

* Transactions of a society for the improvement of medical and chirurgical knowledge, vol. 3, p. 275.

† Vol. 3, p. 84.

‡ Medico-Chirurgical Transactions, vol. 3, p. 84, 323; vol. 4, p. 297; vol. 5, p. 156; vol. 6, p. 133, 141, 221.

§ Edinburgh Med. and Surg. Journal, vol. 9, p. 199; vol. 10, p. 284; vol. 12, p. 205, 238, 247.

‖ On Diagnosis, by Marshall Hall, M. D. &c.

¶ Practical Illustrations of Typhus Fever, by John Armstrong, M. D. p. 334, Am. ed.

** Surgical observations, by Charles Bell, part 1, p. 14.

†† A compendium of medical practice, by James Bedingfield, p. 51, Am. ed.

the Dictionnaire des Sciences Medicales, which appeared in 1812.* In 1819, a memoir was published by M. Bayle, entitled, "Mémoire sur l'œdème de la glotte, ou angine laryngée œdémateuse."† This is a valuable production; but it relates entirely to that variety of the disease which is attended with effusion under the mucous membrane of the larynx.

In this country we are not without our contributions on this interesting subject. So early as the year 1808, in a paper on the cynanche trachealis, by Dr. Dick of Virginia, this disease is distinctly alluded to. He speaks of it as the most inveterate species of the croup; and from its being confined to the larynx, he assigns to it the name of *Cynanche laryngæa.*‡ More recently, important and highly instructive cases of it have been recorded by Drs. Bliss§ and Peixotto‖ of New-York, and Dr. Jackson¶ of Boston.

Besides the cases and detached remarks just enumerated, I am not aware that any thing of importance has been done on this subject. At any rate, no general essay concerning it, as far as my knowledge extends, has yet been attempted. To supply, if possible, this defect in our medical literature, is the object of the present paper. An attempt to which I am the more emboldened, as the frequent occurence of the disease in this city during the last year has afforded me no inconsiderable opportunities of becoming practically acquainted with it.**

Character and symptoms. In its commencement this dis-

* Art. Angine. † Nouveau Journal de Medicine, Janvier, 1819.

‡ Facts and observations relative to the disease of Cynanche Trachealis or Croup, by Dr. Elisha C. Dick of Alexandria; Barton's Medical and Physical Journal, third supplement, p. 242.

§ Trans. of the Physico-Medical Society of New-York, vol. 1, p. 115, N. Y. 1817.

‖ New-York Medical and Physical Journal, vol. 2, p. 436.

¶ The New-England Journal of Medicine and Surgery, vol. 10, p. 222.

** This essay was first published in the year 1824. Since then the attention of the medical profession has been more especially directed to this disease, and highly valuable contributions have been made by several individuals. Among these I would more particularly notice "Observations on the Surgical pathology of the Larynx and Trachea, chiefly with a view to illustrate the affections of those organs which may require the operation of bronchotomy, &c. by W. H. Porter, member of the Royal College of Surgeons of Ireland." 8vo. 1826.

Important cases and observation will also be found in the later volumes of the Medico-Chirurgical Transactions of London, in Johnson's Medico-Chirurgical Review, and in the Edinburgh Medical and Surgical Journal. See also an article on this subject by Dr. Cheyne in the Cyclopædia of Practical Medicine.

ease may be looked upon as purely local, and the first symptom by which it is usually ushered in, is a slight sense of soreness in the fauces, resembling what is commonly called a sore throat. As this is considered nothing more than the effect of an ordinary cold, it excites no alarm, and most commonly is slighted by the patient. Frequenty no febrile symptoms are present, and he sometimes finds himself well enough to attend to his ordinary business. If the fauces be examined, they will perhaps be found covered with a blush of inflammation, unaccompanied generally by any swelling of the tonsils or neighboring parts. This state of the throat continuing for a day or two, the patient is suddenly seized with a sense of great uneasiness about the region of the larynx. The pain in the part is by no means acute, and the principal source of complaint is a feeling of stricture or obstruction about the passage of the larynx, through which the air passes in respiration. For the purpose of relieving this obstruction, frequent attempts are made to clear the throat by hawking, &c. The voice now becomes affected with greater or less hoarseness, according to the violence of the attack. Connected with this, there is labor in respiration and slight difficulty of deglutition. As the disease advances, sometimes in the course of a few hours, at others in a day or two, all the symptoms increase in force. The respiration becomes more impeded; the voice hoarser and more suppressed; the deglutition more difficult. Occasional fits of suffocation now come on, which sometimes last for several minutes, and occasion the greatest distress. As these subside, the patient becomes easier, without, however, experiencing the least amelioration of the other symptoms. At longer or shorter intervals, the fits of suffocation are repeated, and at each repetition, they become more violent and distressing. Frequently they seize the patient during sleep. The anguish which is exhibited at this stage of the disease, and during the paroxysms of interrupted respiration, can better be imagined than described. The larynx is perceived in violent motion—the head is thrown back, and on the countenance is depicted the extremest agony; the eyes are wild and prominent, the mouth is open as

if gasping for breath, the lips are pale, the tongue protrudes, and the voice is scarcely audible. In this situation, patients have not unfrequently attempted to end their sufferings by endeavouring to cut their throats.* It is evident that under such circumstances, life cannot be protracted very long, and the wretched victim, after a few convulsive efforts, expires from actual suffocation. Such is the general career of this disease, necessarily varying somewhat in individual cases, according to the violence of the assault and the peculiarities of the patient's constitution. In some instances, not the slightest trace of inflammation is to be detected on examining the fauces; and with the exception of the local uneasiness about the larynx, there is nothing which indicates the imminent danger in which the patient is situated.

I have hitherto said nothing of the symptoms of general febrile or inflammatory excitement as characterizing this disease, because, although in many cases they are very striking, yet in others they are wanting, and in some of the very worst cases they do not make their appearance from the commencement to the termination of the disorder. So striking indeed is this latter fact, that by Bayle it is considered as constituting a positive evidence of there being two distinct affections, to which the larynx is subject; the one being a simple œdema of that organ, while the other is the inflammatory affection of the mucous membrane, described by Boerhaave and other authors. To myself, however, there does not appear to be any just ground for this distinction. In all the cases recorded by Bayle, and which are precisely similar to those of Baillie, Farre, &c. there can be no question that the disease was primarily and essentially a subacute inflammation of the mucous membrane of the larynx, and the œdema was nothing more than the consequence of this inflammation—being an effusion into the cellular tissue lying underneath it, and connecting it with the surrounding parts.† Looking upon it in this point of view, it

* Cases of this kind are related by Bayle.

† This opinion I conceive to be fully established by the post mortem examinations of cases of what are called *œdema of the glottis*. In almost every instance, more of less inflammation of the mucous membrane of the larynx has been detected. In confirmation of this fact, the reader is referred, among others, to the following cases:

is easy to account for the absence of febrile symptoms, as well as for the fatal nature of these cases. The effusion relieves, to a certain extent, the local inflammation, and thus prevents reaction; at the same time that it mechanically closes the rima glottidis by the distension which it occasions, and thus destroys the patient. If the inflammation of the laryngeal membrane, on the other hand, be greater, general febrile and inflammatory symptoms may come on, and instead of this passive infiltration in the subjacent cellular tissue, it may terminate in the effusion of coagulable lymph on the surface of the membrane, and sometimes in ulceration and destruction of the parts. If this view be correct, it is evident that the only difference in these cases consists in the degree of inflammation, and the consequences of it, resulting from the peculiar structure of the larynx, and not, as Bayle supposes, in any specific difference of disease.

The most usual duration of this disorder is from three to five days. In not a few cases, however, it has proved fatal within the first twenty-four hours, and in some even during the first paroxysm of suffocation.* By Bayle, instances are related in which it was protracted during the space of several weeks, and then terminated fatally. Such instances, however, are rare.

Cases by Dr. Farre, Medico-Chirurgical Transactions of London, vol. 3, p. 34.

Cases by Dr. Bouillaud, recorded in Johnson's Medico-Chirurgical Review, N. S. vol. 3, p. 205.

Cases by Mr. Porter, in his work on the Surgical Pathology of the Larynx and Trachea. p. 111.

I am happy to find this opinion sustained by other authority than my own. Dr. James Johnson, in an article in which he notices this very essay, says, "The term *Angina œdematosa* appears to be unnecessary. The œdema clearly constitutes no fundamental character of the disease. It is an effect or consequence of the acute inflammation going on in the parts."—Medico-Chirurgical Review, N. S. vol. 3, (for 1825,) p. 207.

On this point, Andral says, "Œdema of the glottis is nothing more than a considerable infiltration of the cellular tissue situated between the folds of the mucous membrane which surrounds the rima of the glottis, and which, from being thus distended and swollen, obstructs the passage of the larynx to a greater or less degree. This œdema rarely occurs as an idiopathic disease: it is most commonly connected with acute inflammation of the mucous membrane of the larynx, though it sometimes occurs during the progress of chronic affections of that organ." (A Treatise on Pathological Anatomy, by G. Andral, translated by Townsend and West, vol. 2, p. 310. American edition.)

* Mr. Porter relates two cases of young men, who had retired to bed at night without complaining, and were found dead from this affection on the next morning. (Observations on the Surgical Pathology of the Larynx and Trachea, p. 95.)

It may be considered as one of the striking peculiarities of laryngitis, that its attacks are confined to persons who have reached adult life. Such has, at least, been the case in almost every instance which has as yet been recorded. In some it has been at the advanced age of sixty, and even upwards. Most usually, however, it occurs in the prime of life, between the years of puberty and forty-five or fifty. In a very few instances, it has been observed in children. By Dr. Marshall Hall, cases of this kind are recorded.* But in these, it should be recollected that the disease was induced by the accidental application of a powerfully stimulating cause to the parts themselves, in which, of course, predisposition could have had no agency at all. With regard to other cases that have been adduced of its occurring in infancy and childhood, they are in many respects so unsatisfactory as scarcely to justify us in considering them as genuine instances of this disease.

Although not confined exclusively to either sex, yet males appear to be much more liable to inflammation of the larynx than females. This is a curious fact, confirmed by the histories of the cases which have been recorded. Whether this be purely accidental, or whether it be owing to the greater exposure of males to the causes producing the disease, it is not easy to say.

From the frequency of inflammatory affections, and especially those of the throat in the autumn and winter, it might naturally be supposed that this disorder would be more likely to occur in those seasons, than in any other portion of the year; and this has been verified by the result of observation. It may, however, take place at any period of the year, if the patient be exposed to sudden transitions of temperature, or to an atmosphere loaded with moisture.

In many, perhaps in a majority of cases, it has been remarked that the patients had been previously subject to catarrh, quinsy, &c. From the vicinity of the organs affected in these complaints, it can readily be conceived how inflammation of them would predispose the larynx to be similarly affected.

* Four cases of children who had attempted, by mistake, to drink boiling water from the spout of a teakettle. By Marshall Hall, M.D. &c. (Medico-Chirurgical Transactions. vol. 12. p. 1.)

Appearances on dissection. On opening the body of a person who has died of laryngitis, the tonsils and the velum pendulum palati will be found perhaps slightly inflamed. In some instances, the posterior and upper portion of the tongue is also somewhat inflamed. The epiglottis most generally exhibits the evidences of high inflammation, and is much thickened: it frequently stands erect, so as to leave the cavity of the larynx almost entirely uncovered. In the larynx, various morbid appearances present themselves, depending upon the violence and duration of the previous disease. In some instances no other evidences of diseases are observable, besides a simple redness and thickening of the mucous membrane of the larynx. This thickening is frequently so great as nearly to obliterate the cavity of the glottis.

In other cases, together with the inflamed condition of the mucous membrane of the larynx, there is found an effusion of serum in the cellular tissue underneath it, so great as completely to close the rima glottidis. This constitutes that form of the disease which is known by the name of *œdema of the glottis.*

In other cases, again, the inflammation of the membrane of the larynx terminates in effusion of lymph upon its external surface, by which the passage of the glottis is either completely closed, or very much diminished in size.

Occasionally purulent matter has been detected on the larynx; and in one case, an extensive abscess was found between the mucous membrane and the muscles of the larynx.* Generally, the trachea is unaffected. In some cases, however, slight traces of previous inflammation are discovered. It is not followed by effusion; and in no instance, I believe, has any thing like the croupy membrane been formed.

The lungs are also more or less affected. In two of the cases recorded by Dr. Baillie, "the lungs did not collapse upon taking off the sternum." In one of Dr. Farre's cases, the lungs were slightly congested; and in the other, "there was some accumulation of mucus in the cells of the lungs, and a slight effusion of serum into their reticular structure; the left pleura

* See History and Dissection of a fatal case of Cynanche laryngæa, by Edward Percival, M.D. (Medico-Chirurgical Transactions of London, vol. 4, p. 304.)

partially adhered, and the cavities contained rather more fluid than is natural to them." By Bayle, it is stated that the lungs were found gorged with blood. By the same writer, the blood is asserted to be darker coloured, and more difficult to coagulate than healthy blood. These appearances are very justly ascribed to the deficiency of oxygen with which the lungs are supplied, and the consequent superabundance of carbon in the blood; and it is to the interruption in the process of respiration, that death in this disease is to be ascribed. What confirms this opinion, is the fact that the condition of the lungs resembles in every respect that of those who die in consequence of suspended respiration from other causes.

Causes. Among the causes capable of producing this disease, may be mentioned, sudden variations of temperature; diseases of some of the neighbouring organs; the application of a powerful stimulus to the part itself.

Sudden variations of temperature. As of all other inflammatory disorders, this is unquestionably the most common cause of laryngitis. Most of the cases on record have arisen from imprudent exposure of the body. A humid atmosphere would also seem to be more particularly favourable to the development of the disease. This was strikingly confirmed in this city in 1823, when it may almost be said to have prevailed epidemically.

Diseases of the neighbouring organs. From the contiguity of the tonsils, pharynx, &c. to the larynx, it is easy to see how affections of the former may involve the latter. There is every reason to believe, that even ordinary inflammation of the tonsils sometimes proves suddenly fatal by the diseased action extending to the larynx. That this is particularly the case in the malignant form of the disease, (Cynanche maligna,) will scarcely admit of a question. In those cases of this latter disease which sometimes occur, in which the patient dies suddenly and unexpectedly, this occurrence may generally be traced to the extension of diseased action to the larynx.

That disease of the pharynx may produce a subsequent affection of the larynx, is established by several cases on record. Mr. Bedingfield relates the case of a woman aged thirty, who,

during convalescence from pneumonia, was attacked with difficulty of deglutition and respiration, hoarseness and suppression of voice, cough, &c. On examining the fauces, no appearance of disease could be detected. After remaining in this condition for twelve weeks, the patient died; and on dissection, the larynx was found inflamed, and the membrane so much thickened as to diminish very considerably the rima glottidis. On continuing the dissection, it was discovered that the cause of this mischief in the larynx was a tumour, in shape and size resembling a filbert, situated at the anterior pharynx, just below the rima glottidis.* By its pressure, it had produced ulceration in the pharynx, as well as the morbid appearance just described in the larynx.

Mr. Charles Bell gives the history of a case of diseased pharynx, which, after about a month's continuance, spread to the larynx; and towards the close of the disease, this seemed to be the part mainly affected. After a protracted sickness of nearly three months, the patient, a woman about thirty-five years old, died; and on dissection, the pharynx and beginning of the œsophagus were found studded with scirrhous tumours, so as nearly to close the passage. "Where the mucous membrane was reflected over the glottis into the trachea, it was found much thickened, white, and dense; and on looking through the larynx from below, two white tumours were seen projecting from the sides of the tube. These left a triangular opening so small, that it was wonderful this poor woman could breathe so long."†

The application of a powerful stimulus to the part. The stimulus to which I allude is boiling water or steam. In the Medico-Chirurgical Transactions of London are related several interesting cases of children who, by mistake, attempted to drink boiling water from the spout of a tea-kettle. From the report of the writer, it appears that the effects were not, as might have been expected, inflammation of the œsophagus and stomach, but inflammation of the glottis and larynx.‡ In the New-York Hospital, as I am informed by the

* A Compendium of Medical Practice, by James Bedingfield, p. 51.

† Surgical Observations, Part I. by Charles Bell, p. 53.

‡ By Marshall Hall, M. D. &c. vol. 12, p. 1.

former house-surgeon, Dr. F. G. King, cases of a similar character have occurred in several persons who were scalded on board one of our steam-boats, from the bursting of the boiler of the vessel. The inhalation of the hot steam produced all the symptoms of acute laryngitis.

Diagnosis. As laryngitis destroys life with great rapidity, the physician has frequently but a very short period allowed him in which to put forth the resources of his art for the rescue of his patient. To enable him to use the most prompt and efficacious means for this purpose, it is necessary that it should be clearly distinguished from those of the neighbouring organs, with which it may be confounded.

Tonsillitis. In this disease both the respiration and deglutition are sometimes seriously affected, but as these are occasioned entirely by the inflammation and enlargement of the tonsils, it may readily be distinguished by an inspection of the fauces. In laryngitis, no tumour or swelling of the tonsils is observed, and the difficulty of respiration is not merely greater, but arises from a cause entirely different.

Pharyngitis. The freedom of the respiration in this complaint, while the difficulty of swallowing is exceedingly great, sufficiently distinguishes it from laryngitis.

Trachitis. This is the disease most liable to be confounded with laryngitis, and which it is of the most importance correctly to distinguish, inasmuch as upon it may depend our decision in relation to one of the most essential means of relief, viz: the operation of laryngotomy. Although these two diseases have several symptoms in common, yet I believe an attentive observer will experience little difficulty in recognizing the existence of either, if the symptoms are tolerably well marked. Those which distinguish laryngitis, are the soreness of the throat, and the blush of inflammation observed in the fauces, in the onset of the disease — the early and great suppression of the voice—difficulty of deglutition—and the seat of distress being the region of the larynx. In all of these respects it differs very strikingly from croup, in which there is no previous affection of the fauces—no loss of voice—no difficulty of deglutition. In croup, moreover, the

disease extends down through the trachea into the lungs, and there is always present that peculiar ringing cough, which is at once recognized by those who have ever heard it.*

Aneurism. Aneurisms in the neighbourhood of the larynx, occasionally give rise to all the symptoms of laryngitis. Bayle relates the particulars of a case in which these symptoms were occasioned by an aneurism of the aorta pressing upon the trachea. On dissection, the larynx was ascertained to be

* The disease of which General Washington died, although denominated croup by many, I am inclined to consider as laryngitis. The following is the account given of it by the attending physicians, Drs. Craik and Dick.

"Sometime in the night of Friday the 13th instant, having been exposed to the rain on the preceding day, General Washington was attacked with an inflammatory affection of the upper part of the windpipe, called in technical language, *cynanche trachealis*. The disease commenced with a violent ague, accompanied with some pain in the upper and fore part of the throat, a sense of stricture in the same part, a cough, and a difficult rather than painful deglutition, which were soon succeeded by fever and a quick and laborious respiration. The necessity of bloodletting suggesting itself to the General, he procured a bleeder in the neighborhood, who took from his arm, in the night twelve or fourteen ounces of blood. He would not by any means be prevailed upon by the family to send for the attending physician, till the following morning, who arrived at Mount Vernon at about eleven o'clock on Saturday. Discovering the case to be highly alarming, and foreseeing the fatal tendency of the disease, two consulting physicians were immediately sent for, who arrived, one at half after three, the other at four o'clock in the afternoon. In the interim were employed two copious bleedings, a blister was applied to the part affected, two moderate doses of calomel were given, and an injection was administered, which operated on the lower intestines: But all without any perceptible advantage; the respiration becoming still more difficult and distressing. Upon the arrival of the first of the consulting physicians, it was agreed, as there was yet no signs of accumulation in the bronchial vessels of the lungs, to try the result of another bleeding, when about thirty-two ounces of blood were drawn, without the smallest apparent alleviation of the disease. Vapours of vinegar and water were frequently inhaled, ten grains of calomel were given, succeeded by repeated doses of emetic tartar, amounting, in all, to five or six grains, with no other effect than a copious discharge from the bowels. The powers of life seemed now manifestly yielding to the force of the disorder. Blisters were applied to the extremities, together with a cataplasm of bran and vinegar to the throat. Speaking, which was painful from the beginning, now became almost impracticable; respiration grew more and more contracted and imperfect, till half past eleven o'clock on Saturday night, when, retaining the full possession of his intellect, he expired without a struggle.

"He was fully impressed at the beginning of his complaint, as well as through every succeeding stage of it, that its conclusion would be mortal, submitting to the several exertions made for his recovery rather as a duty than from any expectations of their efficacy. He considered the operations of death upon his system as coeval with the disease; and several hours before his decease, after repeated efforts to be understood, succeeded in expressing a desire that he might be permitted to die without interruption.

"During the short period of his illness, he economized his time in the arrangement of such few concerns as required his attention, with the utmost serenity, and anticipated his approaching dissolution with every demonstration of that equanimity for which his whole life had been so uniformly and singularly conspicuous." (New-York Medical Repository, vol. 3, p. 311.)

perfectly healthy.* Mr. Lawrence furnishes us with an instance in which similar effects were produced by an aneurism of the arteria innominata.†

Mr. Wood says, "I know an instance where this mistake led to the performance of tracheotomy, which was attended with the bursting of the aneurism into the trachea; and from a preparation which I lately saw in the College of Surgeons, it appears probable that the same unexpected event must have annoyed another practitioner. In this preparation there is an artificial opening in the larynx; just above the bifurcation of the trachea, another opening is seen to communicate with the cavity of the ruptured sac of an aneurism."‡

Dr. Hope states that bronchotomy has several times been performed with the view of obviating suffocation produced by aneurism of the aorta. More striking facts need not be stated, to show the importance of a correct diagnosis in these cases.§

An abscess in the neighbourhood of the larynx. This has been known to produce the symptoms of laryngitis. A case is mentioned in the Edinburgh Medical and Surgical Journal, in which the sac of an abscess was found attached to the under surface of the muscles covering the thyroid cartilage, being reflected over that cartilage, and bounding nearly the extent of the os hyoides. It contained about half an ounce of pus. It produced all the symptoms of inflammation of the larynx, and the patient died of it. The trachea and larynx, on dissection, did not discover any unusual vascularity; they contained only some common mucus; the sacculi laryngis were filled with pus.‖

Treatment. As this disease consists in an inflammation of the larynx, terminating in effusions, which so far close the rima glottidis as to interrupt regular and healthy respiration, our indications of cure seem to be simple and clear. They are, in the first place, to arrest if possible, the progress of in-

* Nouveau Journal de Médecine, Janvier, 1819, p. 51.

† Medico-Chirurgical Transactions, vol. 6, p. 227.

‡ Medico-Chirurgical Transctions of London, vol. 17, p. 175.

§ On this point I must refer to the valuable work of Dr. J. Hope, "on the diseases of the Heart and Great Vessels."

‖ Edinburgh Medical and Surgical Journal, vol. 16, p. 156.

flammation, and thus prevent effusion; and, if we should fail in this object, in the second place, by means of an artificial opening in the trachea, to enable the patient to breathe until the obstructions in the larynx may be removed, either by the process of absorption, or by the aid of medicine. Our means for accomplishing the first of these objects are bloodletting, emetics, cathartics, blisters, and mercury. The second requires the operation of tracheotomy.

Although the general principles of treating this disease appear to be thus obvious, yet the little success which has hitherto attended the management of it, even in the hands of the most distinguished professional men, is a sufficient apology for entering upon this part of our subject somewhat more in detail.

Bloodletting. Although almost every writer who has treated of this subject has assigned the first place to bloodletting, and although there are few practitioners who, when called to a case, would not immediately have recourse to this powerful agent; yet it must be conceded, that it does not appear, as the result of impartial experience, that this remedy, even when very liberally employed, has been attended with that decided advantage, which might naturally have been expected. Dr. Armstrong informs us, that out of six cases, there was only one in which venesection was conspicuously serviceable; and in almost all the fatal cases that are recorded, it will be found that this remedy has been pretty freely used. Conceding all this, it does not justify the unfavorable inference which has been drawn by some against the use of bloodletting. Like every other agent in medicine, bloodletting differs entirely in its effects, according to the extent to which it is carried, as well as according to the stage of the disorder in which it is used. And I am inclined to believe, as well from theory as from experience, that in many instances of this disease, where the use of venesection has not been attended with any beneficial consequences, it may be attributed either to its not having been carried to a sufficient extent, or to its having been used at that stage of the disorder when organic changes had already taken place, and when, of course, instead of doing

any good, it must be productive of positive injury. In speaking of the extent to which bloodletting ought to be pushed, I do not refer at all to the *absolute quantity* of blood which may be drawn, but entirely to the *effect* produced upon the system. This effect is syncope; and in all cases where the condition of the patient does not absolutely contra-indicate the measure, to bring about this should be the object of the practitioner. The insidious nature of the first periods of this disease, and the rapid progress which it makes to effusion, ought to convince the medical attendant that nothing short of the boldest treatment can rescue his patient from destruction. By ordinary bloodletting it is scarcely possible to reach the seat of disease, remote and circumscribed as it is in the larynx. Even supposing, however, that such a bleeding could reach it, its only effect would be to *moderate* the action in the part. That it could not *arrest* its progress must be evident, when it is recollected how very slight a degree of inflammation in the larynx will produce all the dreadful consequences attendant upon this affection.

The very same reasons which induce me to consider that the ordinary abstraction of blood can be attended with no great benefit in this disease, convince me of the high and unequivocal advantages which result from carrying it ad deliquium. When this effect is produced, the most distant as well as the minutest parts of the system come within the sphere of its influence; it not merely moderates, but it suspends and alters existing actions, at the same time that it relaxes spasm, a symptom which, in a greater or less degree, always accompanies inflammation of the larynx.

In those unfortunate cases where effusion has already taken place under the mucous membrane of the larynx, constituting the œdematous condition of these parts, it is evident that bleeding, however practised, can be of but little service; yet even here, as it is impossible to know positively that such effusion has actually occurred, it may be considered in every respect as the safest practice, and certainly the one promising the greatest chance of relief, to have recourse to a single bleeding, which shall be felt at once throughout the system,

rather than to repeated bleedings, the only effect of which must be to weaken and finally exhaust the strength of the patient.

There is another consideration, too, in connexion with this point, of considerable importance. If it shall be found, after bleeding ad deliquium, that the symptoms are not mitigated, it may with great probability be inferred that such effusion has already taken place, and that other means of relief must accordingly be resorted to. The value of any test by which to judge of the actual state of the parts, and of the progress which the disease has made, can only be appreciated by those to whose lot it has fallen to witness the march of this terrific disorder. No such inference can be drawn from the effect of bleeding, which is not carried to the extent already proposed. Whether the view that has just been taken be correct or not, the result of experience is most decidedly in favour of this practice. As the object in this complaint ought to be, to induce syncope with the least sacrifice of the patient's strength, it is proper to suggest that he should be bled while standing, and from a large orifice. As auxiliaries to general depletion, the local abstraction of blood from the throat by leeches, may be used with advantage, especially where it is not considered advisable to carry general bleeding to any further extent.

Emetics. Next to bloodletting, emetics are the remedies best calculated to afford prompt and decided relief; and they do so, not merely by the relaxing effects which they have upon the whole system, but by the copious secretions which they produce from the mouth and fauces. By most writers they do not seem, however, to have been treated with any thing like the importance justly due to them. In most of the individual cases of the disease which have been published, especially those in Great Britain, emetics are not to be found among the articles which were resorted to. Dr. Armstrong is the only modern writer who insists upon their use in a manner at all proportioned to their value; and he states that he was induced to try them in the commencement of the disorder, from the want of success which had previously attended him in several cases, where he had relied upon copious bloodletting. His

practice consisted in giving tartarized antimony combined with ipecacuanha, in repeated doses, until free and frequent vomiting took place. "No circumstance," he adds, "in my professional life ever gratified me more, than the great and sudden relief which the vomiting afforded; in reality it removed all the urgent symptoms at the time, and being excited as soon as even the slightest signs of stricture returned, at last completed the recovery."* Subsequent experience seems to have convinced this very accomplished physician, that in cases where the inflammation runs high, it is not perfectly safe to rely upon emetics alone, to the exclusion of the ordinary means for subduing inflammatory action. That cases may frequently occur, in which emetics, unaided by other remedies, may be fully adequate to the removal of the disease, is unquestionable; yet, as a general rule, it may be considered as the soundest practice, in every point of view, to premise a copious bleeding, which if it produces no precise effect upon the disease itself, is yet the most efficacious means of preparing the system for the prompt and salutary operation of emetics, an object certainly of very great consequence, and one which perhaps is not sufficiently regarded in practice.

Purgatives. Besides unloading the intestinal canal of whatever offensive matter may be present, purgatives may prove beneficial, by lowering the general action of the system, and by creating a new centre of irritation, and thereby diverting the flow of blood from the parts labouring under disease. It is in this latter way chiefly that purgatives prove of use in laryngitis. Too much dependence, however, should not be placed upon them, inasmuch as they can at best exercise but a remote influence over the disease, while, from the slowness of their operation, much valuable time may be lost in securing the safety of the patient by other and more efficacious means.

Blisters. It has become so much a matter of course to apply blisters in all cases of local inflammation, that to call in question the propriety or efficacy of the practice, may appear

* Practical Illustrations of typhus fever, &c. by John Armstrong, M.D. &c. p. 336. American edition.

to savour of skepticism, in relation to remedies sanctioned by time and experience. Nevertheless, it is very questionable whether, in the disease under consideration, blisters have proved of that unequivocal utility which, by some, has been attributed to them. In many of the cases which have terminated fatally, they have been used, and in some to a very unexampled extent. Notwithstanding this, the application of *very large* blisters appears to have been attended, in some cases, with decided benefit. By Sir Gilbert Blane, great importance is attached to them; and in recommending them, he insists particularly upon their being of a large size.* As auxiliaries, they may unquestionably prove advantageous, and it is important therefore to determine at what stage of the disease they are most proper, and where they should be applied.

From the view which has been taken of this disease, it is perfectly obvious that if they are to do any good at all, they must be used very early. In every point of view, it is the best practice to apply them immediately after venesection. The next point to be determined is, whether they should be applied directly over the part affected, or at a distance from it. If the effects of a blister be, as they undoubtedly are, to excite local irritation, and, as a consequence of this, to produce a current of fluids to the blistered part, then it would seem to be self-evident, that they should never be placed too near the original seat of disease, as their effect must necessarily be that of increasing the afflux of the fluids upon organs already labouring and oppressed from this very cause. In the case of laryngitis, from the vicinity of the diseased organ to the surface over it, it appears plain that the application of a blister to the throat must increase the determination of blood to the larynx; and if this is the fact, the practice is very clearly improper. Independently of this consideration, the application of a blister to the throat may be rendered objectionable by its interfering with the use of leeches. The situations most appropriate, perhaps, for this remedy, are the chest, abdomen and back of the neck, and that some substantial good may be derived from them, they should be of a *large size*, and kept running during the disease.

* Medico-Chirurgical Transactions of London, vol. 6, p. 146.

Calomel. After the use of depletion and emetics, to break the violence of the disease, there is no article within the knowledge of our art which can be trusted to with such just confidence for accomplishing a cure as calomel. To be effectual, however, it must not be used with a timid hand. From the great rapidity with which the disease frequently runs its career, it is evident, that unless introduced with such decision as to bring the system speedily under its influence, mercury can be of no service. It should be commenced with, therefore, early in the disease, and should be unwaveringly persisted in, until this object is accomplished. There is nothing which can supply its place, and scarcely any symptom which can contra-indicate its use. The high general inflammatory action characterizing some of the phlegmasiæ, and which renders the use of mercury so frequently improper, is, as we have seen, very seldom present in laryngitis; and if it should be in the commencement of the disorder, it may be sufficiently subdued by previous bleeding and emetics. On this ground, therefore, nothing is to be apprehended from its use. Besides this, another advantage attending it is, that it cannot interfere with a single other measure that may be thought advisable. With regard to the extent to which mercury should be carried, I would insist in an especial manner upon the necessity of producing free ptyalism in every case where it can be effected. Independently of its being the only certain criterion by which to judge that the system is under its influence, the greatest advantages are to be expected from the copious secretions which are thus produced from the glands of the mouth and throat. At any rate, whether it be explained upon this principle or not, it is only when carried to this extent, that calomel has proved eminently successful. In many cases in which this remedy has been used, without, however, occasioning salivation, the disease has nevertheless terminated fatally. Yet I have not met with a single one which did not end favourably in which the mouth became affected.

Tracheotomy. When all our efforts at subduing the inflammation in the larynx have failed, and we find the obstructions to respiration constantly increasing, the only resource left is,

to make an artificial opening into the windpipe. That this may be done without the least hazard, has been proved by multiplied experiments,* and the success which has already attended its employment in laryngitis, should encourage us to a repetition of it in all cases where other means have proved ineffectual. There are two circumstances more particularly deserving of attention in relation to this operation, and on which its success may be said principally to depend. The first is, that it should not be delayed until the last stages of the disease, when the patient is already sinking under the prostrating effects of long impeded respiration. To perform the operation under these circumstances, may indeed display the dexterity of the surgeon, but it can be of no benefit to the suffering patient. Whoever has attentively read the histories of the cases which are upon record, cannot but have been forcibly struck with the truth of this remark. Dr. Baillie suggested, that if no substantial benefit was gained from medicine in thirty hours, the operation of bronchotomy might be resorted to. It is evident, however, that no general rule can be laid down or observed on this subject. In some cases it may be delayed much longer, while in others, to wait this length of time would be attended with the loss of the patient's life. Every thing of course must be decided by the existing emergencies of the case. The other circumstance to which I allude, is the size of the opening made into the trachea. In the ordinary way in which the operation is performed, the orifice speedily closes, or if kept open by a canula, the presence of this foreign body inevitably produces great irritation in the parts, and thus jeopardizes its ultimate success. To obviate these effects, Mr. Carmichael, in a recent case of laryngitis, made a large opening into the trachea, by cutting away portions of the rings. The complete success which attended the case, together with the just reasoning of that distinguised surgeon in relation to it, is sufficient to establish it

* For an elaborate detail of facts on this point, see an interesting paper by William Lawrence, esq. in the Medico-Chirurg. Transactions of London, vol. 6, p. 221. See also a valuable paper on Bronchotomy as connected with inflammation of the larynx, by John Wood of St. Bartholomew's Hospital, in the Medico-Chirurgical Transactions, vol. 17, p. 138.

as a great improvement in the mode of performing this operation.*

In concluding these observations, I shall give the history of three cases, as illustrative of the varieties of this disease, which have been noticed. For the particulars of the first, I am indebted to my friend, Richard K. Hoffman, M. D. of this city. It is a melancholy instance of the overwhelming rapidity with which the disease sometimes destroys its victim.

* I cannot do better than quote the interesting account of this operation as furnished by Mr. Carmichael.

"Having ascertained the lower edge of the thyroid gland, an incision, about an inch and a half in length, was made through the integuments from this point to within a finger's breadth of the sternum. The incision was continued between the sterno-hyoidei and the sterno-thyroidei muscles, until the rings of the trachea were fairly exposed. This momentous part of the operation was performed in a few seconds: for with the aid of my assistants, who separated the lips of the wound by means of retractors, I was enabled to see the parts which it was necessary to divide; and by the fore-finger of the left hand I successively felt each part previous to the application of the knife, the edge of which, after the division of the skin, was directed constantly upwards during the subsequent parts of the operation; and these precautions were a sufficient security against wounding the arteria innominata, which sometimes rises above the sternum, or from dividing any known or anomalous arterial branch of magnitude which might course in front of the trachea.

"This was all happily accomplished, with very little delay, and the loss of a very few drops of blood, notwithstanding the difficulty which the perpetual motion of the trachea opposes in a person incessantly gasping for breath: two, or perhaps three, of the rings of the trachea, were then divided from below upwards, and this opening was immediately widened by means of a large pair of sharp-pointed scissors, such as I employ for the operation of hare-lip. With these I had provided myself, knowing from previous operations the difficulty of removing by the knife a slip of the rings of the trachea, as recommended by Mr. Lawrence. Some little address is necessary in performing this part of the operation. The sharp point of one blade was introduced at the lowest part of the opening in the trachea, and directed outward so far as to admit, on the closing of the blades, of the division of an extent of the tracheal rings, equal to one half of the opening already made in them; the flap thus made was laid hold of by a pair of dissecting forceps; the point of the scissors was again introduced into the trachea, where the last incision terminated, and carried inwards towards the central opening. Similar incisions in the same manner were made on the opposite side, and a diamond-shaped opening, capable of admitting the point of the little finger with ease, was left in the trachea.

"The patient coughed up a large quantity of thick viscid phlegm through the opening, and seemed so much relieved, that the appearance of suffocation and excessive anxiety which her countenance displayed previous to the operation, immediately disappeared. I am satisfied, that if the operation had been confined in this, as well as in other instances which have occurred to me, to a mere division of the rings of the trachea, that no beneficial result could have followed the measure; and that even the introduction of a tube, which is objectionable on two accounts, would not be attended with any advantage; for, first, a tube excites intolerable irritation, with violent fits of coughing; and, secondly, the apertures in it cannot be sufficiently large to permit the expulsion of the viscid phlegm which accumulates in most of those cases where Tracheotomy is necessary." (Transactions of the College of Physicians of Ireland, vol. 4, p. 312.)

The second case occurred in the person of a physician of this city, and is particularly interesting as presenting more of the general inflammatory, as well as protracted character, than is usually met with in this disorder. The third is a rare and curious case, translated from the memoir of M. Bayle.

CASE I.

At one P. M. on the 10th April, 1823, a servant called at my office, requesting me to hasten to Mr. M., whom she reported to be choking to death. Taking with me some emetic medicines, a probang, and polypus forceps, which were at hand, I immediately attended. On entering the room, I was struck with the extreme anxiety expressed on the patient's countenance. His neck was denuded, the larynx moving violently up and down, his eyes staring, face flushed, and covered with drops of sweat. His whole frame was agitated, and the difficulty of breathing appeared almost insufferable. He pointed to a glass, containing a mixture of Cayenne pepper and vinegar, and applying his hand to his throat, reiterated in a hurried whisper, 'Can't breathe, can't breathe, cayenne pepper,' &c. On attempting to swallow a little water which was handed him, it was convulsively ejected from the mouth. I seated him near the window to examine the fauces; they were rather more red and tumid than natural, but presented to the view no other morbid nor extraneous impediment to respiration. A vein was opened in each arm, (using his cravats for ligatures,) and bled freely; but death supervened from suffocation, with a rapidity as great as if a strict ligature had been made on the trachea.

In the short interval, not exceeding ten or fifteen minutes, from the time of my arrival, until the fatal termination of the case, no account of the previous symptoms could be obtained. It was now ascertained that he had complained of soreness of the throat the evening before, as well as at breakfast, but was not prevented from engaging in his mercantile pursuits that morning. Experiencing some difficulty of breathing, however, he returned home earlier than usual for dinner, and erroneously believing his complaint arose from the palate being

down, resorted to the mixture of Cayenne pepper for relief a few moments before I was called in.

On the following morning, the parts concerned in the disease, as well as the pharynx, fleshy palate and tongue, were detached for examination. The mucous membrane of the fauces appeared slightly inflamed, while that of the rima glottidis especially, was so distended by a visible congestion of the blood vessels, together with an effusion of serum in the subjacent cellular texture, as effectually to conceal and shut up the passage to the windpipe. This inflamed and œdematous condition of the mucous membrane was apparent throughout the larynx, and traces of inflammation extended down the trachea, as far as its bifurcation, where our researches terminated.

The subject was in the prime of life, of a strong constitution, sanguine temperament, and of a plethoric habit of body.

It was a source of satisfaction to the numerous relatives of the deceased, that two gentlemen of the highest eminence in the profession arrived almost simultaneously with myself.

CASE II.

Dr. F. of a sanguine temperament, and of a robust constitution, had been complaining for three or four days of soreness about the fauces, accompanied with some degree of hoarseness and continual sense of thirst. These symptoms were accompanied with considerable difficulty in deglutition, unattended, however, by any cough or expectoration. On the morning of the 17th of November, 1823, on examining the throat, I found the fauces inflamed, but not tumefied. About the middle of the day, the patient was seized with an increased sense of tightness about the throat, attended with pain, great anxiety in breathing, difficulty of swallowing, and a sense of strangulation. After continuing for a few moments, these symptoms gradually abated, but were again renewed with increased violence after a short interval. Blood was immediately taken to the amount of forty ounces, after which an emetic of tartarized antimony and ipecacuanha was administered. The emetic produced little or no effect. Sulphate of soda, oz.j. was shortly after ordered.

7 P. M.—No abatement of the symptoms; pulse full and strong, and about 120 in a minute; skin hot and dry; the difficulty of respiration, as well as of deglutition, still continuing, blood was again drawn to the amount of oz. xx.

18th, 9 A. M.—During the night, the patient had suffered great restlessness, accompanied with much local distress about the throat. This morning his uneasiness was excessive, in consequence of the difficulty of his respiration, and the frequent returns of the sense of strangulation. On pressing the region of the larynx externally, considerable soreness was complained of. The pulse still remaining full and strong, the patient was again bled oz. xvi. and put upon the use of the solution of tartar emetic.

7 P. M.—No abatement in the force or frequency of the pulse having taken place, oz. xvi. of blood were drawn.

19th, 9 A. M.—No amendment—general excitement of the system still great—pulse upwards of 100, and full.—v. s. oz. xvi.—leeches to the throat, and a blister to the chest. The antimonial solution still continued.

In the afternoon, oz. xvi. more of blood were taken; and in the evening ten grains of calomel were ordered.

20th, 9 A. M.—Little or no abatement of the general or local symptoms.—v. s. oz. xvi.—calomel and antimonial powder, in the proportion of four grains of the former and six of the latter, were directed to be given every three hours.

21st.—No alteration of consequence in the condition of the patient—calomel and antimonial powder continued as before.

22d.—The excitement in the system being evidently increased, it was deemed proper to abstract more blood: oz. xii. were accordingly taken—the calomel was still continued.

23d.—The patient states that he feels a slight moisture in the mouth and throat, the first which he has experienced since his attack. In the course of the day the gums became affected. The use of the mercury was now stopped, and a blister ordered to be applied to the throat.

24th.—Pulse still excited: 120 to 130 in a minute.—v. s. oz. xvi.—tart. emet. solution was directed to be given every two hours; at night, Dover's powder grs. x.

25th.—Rather better—continue tart. ant. and renew blister to chest.

26th.—Considerably better during the day.

27th.—During the night, the patient was attacked with a return of the fits of strangulation; they were repeated every five or ten minutes; and to such a degree as almost to threaten the immediate extinction of life. An emetic of tart. ant. and ipecac. was given, without producing any effect. In half an hour another was administered. No vomiting was induced. Great relaxation, however, ensued shortly after, which was succeeded by a profuse perspiration, affording decided relief. The spasms gradually subsided on this effect being produced.

10 A. M.—v. s. oz. xvi. The patient fainted from this bleeding, the first effect of the kind which had yet taken place, notwithstanding the numerous and copious abstractions of blood. After this an emetic of sulph. zinci dr. ss. No effect by vomiting—it produced, however, pretty copious secretion from the mouth and fauces.

For the purpose of keeping up the relaxation induced by the last venesection, tart. emet. gr. ¼. ipecac. gr. ij. were ordered every two hours.

28th.—Rather better—pulse 120—the tart. emet. and ipecac. continued.

29th.—Much better—pulse softer, 100—skin moist—expectoration very copious—slight cough—mercurial fætor very great. The tart. emet. and ipecac. were now discontinued and a dose of senna and manna was ordered, to open the bowels.

From this time he continued gradually to improve. The expectoration, however, remained very profuse for about two or three weeks. After that it subsided, and the patient recovered his usual health. His voice, however, has never recovered its accustomed tone; and, after a year's interval, it is still hoarser than natural. This case was attended by Drs. Hosack, Post, M'Lean. and the writer.*

* In a criticism upon this Essay in the Medico-Chirurgical Review, (see vol. 3, for 1825, p. 203,) Dr. Johnson suggests, "that much less blood would have been lost, in this case, had it been more copiously abstracted in the beginning." I admit the justice of the remark, and I will merely add, that this very case, together with every

CASE III.

Aneurism of the Aorta, simulating Œdema of the Glottis. Stephen Pillet, cartwright, aged 48 years, of high stature, and very robust complexion, having his muscles well developed, countenance naturally pale, the beard and the hair on the head of a deep brown, entered the Charité on the 29th of November, 1808. He had then been sick six months, according to his own account, in consequence of a checked perspiration. He coughed and expectorated a great quantity of glairy and soapy matter; his voice was hoarse, his respiration was troublesome and noisy. Each inspiration was attended with a sort of hissing, or rather a peculiar sound, which might have been compared, if it had been a little more acute, to that which is produced in blowing strongly upon a hautboy; expiration, on the other hand, was free and easy. The patient experienced often a slight pain in the larynx; the least exercise considerably increased the dyspnœa, without causing, however, any palpitations of the heart. The pulse was sufficiently regular in the left arm, but none was perceptible in the right. This peculiarity was known to the patient, who regarded it as natural. The digestive functions were properly exercised, his size was little diminished, his flesh was firm, and without the appearance of infiltration. Six weeks before his entrance into the hospital, an issue had been made in the back of his neck, which had appeared to diminish somewhat the dyspnœa and the hoarseness; about the middle of December it was closed.

The only means which were employed, were the milder aperient drinks, and the theriac in small doses.

Towards the middle of January, the cough and expectoration were sensibly lessened; respiration seemed to be somewhat more free, and less noisy; the patient walked in the yard of the hospital during the whole day, without materially increasing the dyspnœa; he ate with a voracious appetite; he became thin, nevertheless, but slowly; he had no fever at any

other that I have witnessed of this formidable disease, have only served to convince me of the correctness of the opinion which I have expressed in relation to carrying venesection, in the first instance, to the point of syncope.

time, nor even any heat of skin; he constantly felt an uneasiness, and sometimes a little pain in the larynx.

On the 20th of January, he complained of a slight sore throat, which he had had for some time; and in reply to questions put to him, he declared that he had suffered under several venereal affections. At the same time it was thought that some redness could be perceived in the velum of the palate and about the larynx. All these considerations determined the physicians to prescribe a gargle, together with a spoonful of the liquor of Van Swieten, which did not, however, produce any effect.

On the 26th, Pillet, having dined as ordinary, was seized a short time after, with a violent paroxysm of orthopnœa; he could not breathe, unless when seated, stooping forwards, the arms extended, or clinging to the bedside. In this condition, the sound produced by each inspiration was much more loud than usual, the face becoming red in colour, and bordering upon the violet; the pulse was hard, slow, and unequal. At nine in the evening, a large blister was applied on the fore part of the neck. Towards midnight, respiration became more easy, and the next morning he was found, as in the preceding days, lying on his right side, breathing without much difficulty, but always with the same hissing sound accompanying each inspiration.

Towards evening, a new paroxysm of orthopnœa occurred much more violent than the last, and which had not abated as yet on the next morning's visit. The violet colour of the face, the extreme smallness of the pulse, announciug death to be at hand, three grains of emetic were administed, and a new blister applied, after having the part irritated with ammonia.

The patient did not vomit, had some small stools, and expired an hour after taking the emetic.

Autopsical examination twenty hours after death. The larynx was found to be in its natural condition, to the great astonishment of those who had seen the patient. In the hinder part of the mouth, and in the pharynx, all was healthy.

The lower portion of the trachea was compressed and flattened from before, backwards, by an aneurismal tumour, a

little thicker than a man's fist, and of a rounded form. This tumour was formed by the aorta, considerably dilated from about an inch above its origin, to where it is buried between the two pleuræ. The bulging of this artery was chiefly on the posterior side, and at the expense of its posterior coat, so that the tumour, although voluminous, did not touch the sternum nor the ribs, but it bore on the vertebral column, compressing the trachea, to which it intimately adhered by a portion of its surface as large as a sous. The cavity of the sac contained a good deal of blood partly coagulated; its sides were strengthened by a layer of fibrin, about an inch thick in some places, but very thin, and almost entirely worn away toward the centre of the posterior side, where it had adhered to the trachea. In this place, all the coats of the artery were destroyed, the surface of the trachea corroded, and several cartilaginous rings denuded, and as it were dissected, and projecting into the aneurismal sac. Thus the mucous membrane was the only barrier to the irruption of the blood into the trachea, and this would have been soon removed, if the death of the patient had not prevented it, because the mucous membrane already presented a circumscribed spot of a livid red, which appeared to be the commencement of an eschar.

The remaining surface of the sac was free, and offered the same appearance as a healthy aorta. The internal membrane seemed wholly untouched. I observed, however, a slight ossification about the size of the nail of the small finger, at the place where the sac was contracted abruptly to form the continuation of the aorta. There were five or six nearly similar ossifications, dispersed here and there in the internal part of the thoracic and abdominal aorta. This artery had, in all its extent, a more strong calibre than is natural.

The arteria innominata, the sub-clavian, and left carotid, rose from the very centre of the aneurismal sac. The trunk of the first had almost entirely disappeared, so that on first examining it, the right carotid and sub-clavian seemed to rise isolated, and more than an inch's distance from each other. The last, (right carotid) traversed in an oblique direction, and for about an inch, the thick walls of the sac, in nearly the

same manner as the ureter traverses the membranes of the bladder. By this accidental disposition the passage of the blood through the right sub-clavian must have been intercepted, whilst the sac was distended with blood.* No other alteration was perceptible in this artery.

All the other arteries, and the heart itself, were natural.

The lungs were soft, and little elastic, but otherwise healthy. The left bronchia, which was principally compressed by the sac, was gorged with a thick, ropy, and somewhat frothy mucus. The right bronchia was sound: so were all the other organs of the body, &c.

* This accounts for the absence of pulsation in the arm of that side.

The following paper appeared originally in the year 1823, in the New-York Medical and Physical Journal, a periodical of which the author was for some years an editor. Although thrown into the form of a review, and of course published anonymously, it was intended as an essay on the question of the contagiousness, or non-contagiousness, of yellow fever, as it prevailed in New-York in the year 1822. As such it is now reprinted under the responsibility of the author's name. To this step he confesses that he is partly impelled by a wish to correct the representations of certain individuals who have seen fit to use his humble name in support of opinions on the subject of yellow fever, which he has never entertained and never avowed.

It is in consequence of such representations, that the present paper has been looked upon by some eminent individuals, as a recantation of previous faith.* Proud as the author would be of the implied magnanimity of publicly retracting what observation and reason had shown him to be erroneous, he is not justly entitled to the compliment. That his prepossessions may originally have been in favour of the contagious character of yellow fever, he is not prepared to deny. Educated in a school in which this was the prevalent doctrine, how indeed could it be otherwise? He is not aware, however, of having ever committed himself on this subject, and the whole amount of his recantation will appear from the paper itself. As an inquirer after truth, he refrained from forming any definite opinion on so important a subject, until he should have had the opportunity of personal observation. This opportunity occurred partially in 1819, when the fever prevailed in this city, to a limited extent, but more particularly in 1822, when it prevailed more extensively, and furnished the amplest materials for making up a rational judgment.

It may not be improper to observe, that in the following paper no facts have been used except those which came under the author's own observation, or which were reported by official authority. If, therefore, any error be found, it must exist in the reasonings and conclusions of the writer. The facts themselves stand uncontradicted by all parties.

It will be observed that the following paper is confined exclusively to the subject of the contagious, or non-contagious, character of the yellow fever. The origin of the disease is purposely left out of view, as being considered to have no necessary connexion with the question at issue.

For the purpose of making the argument contained in the following paper as intelligible as possible to the reader, it may be necessary to state a few facts in relation to the commencement and subsequent extension of the disease of which it treats. The disease made its first appearance on the 10th of July, 1822, at the lower part of Rector-street, a small street opening upon the Hudson river. Three cases occurred on the same day, two of them at the house situated on one corner of the street, and one at the opposite house. In a few days several cases occurred at a neighbouring house in the same street, and from these points it continued gradually to extend itself in all directions. About the 1st of November, when the disease terminated, the cause of the disease was prevalent over the whole of the lower parts of the city, extending northward as far as Chambers-street. The portion of the city thus affected, was denominated and currently known by the title of the "infected district." As the poison spread itself, the citizens removed before it, and the limits of the district were marked by barring up the streets. The spread of the disease was announced by the occurrence of cases just beyond these limits, and when these occurred, the barriers were extended correspondingly. The sick were in all cases removed from the infected parts, to other parts either of the city or of the surrounding country. The whole amount of cases that occurred, was about four hundred, of which about two hundred and thirty terminated fatally.

* De l'opinion des Medecins Americains sur la contagion ou la non-contagion de la Fievre Jaune, etc. Par N. Chervin, M.D. &c. p. 11. 8vo. Paris 1829.

See also an able Essay on Yellow Fever, by I. Gillkrest, M.D. Deputy Inspector General of the Army From the Cyclopædia of Practical Medicine, p 30. London. 1832.

III.

ON THE NON-CONTAGIOUSNESS OF YELLOW FEVER.

Whether the Yellow Fever be a contagious disease or not, is a question which has long agitated the medical world, and which it does not seem probable will very soon be settled. It is true, indeed, that in this country a very triumphant majority of the profession have united in the disbelief of contagion, as appertaining to Yellow Fever; yet even here, as well as in Great Britain, are to be found arrayed in defence of the opposite doctrine, not a few of the brightest names in medicine. Whatever may have been the cause of this discrepancy of opinion, the fact itself would seem to prove that it is a subject which must be surrounded by very great and numerous difficulties. That it is so in reality will not be questioned by any candid man, however fervid may be his enthusiasm in the defence of the particular creed which he may have adopted. Deeply impressed with this conviction, we had long hesitated in making up a definite opinion on this subject, until actual observation and personal experience should have enabled us to form a more unbiassed judgment than could well be done from the jarring sentiments and conflicting statements of controversial writers. It was with the deepest solicitude, therefore, that we watched the origin and progress of the late pestilence, which desolated the fairest portion of our city. And during its course, facts so abundant and striking were developed, as to produce a positive and complete conviction upon our minds, that contagion had nothing to do in the propagation of the disease. These facts we propose at this time to record, accompanying them with such explanations and reasonings as they may seem to require.

The believers in the doctrine of the contagious character of

Yellow Fever, may be divided into two classes. 1. Those who contend that the disease is contagious under all circumstances, and that it may as readily display this character in the pure and healthy air of the country, as it does in the confined air of our cities. 2. Those who admit that in the pure air of the country it is seldom if ever contagious, while in the impure and vitiated atmosphere of our cities it proves extensively so. Both classes, however, agree in this; that every case of the fever which occurs, must result from contagion, as they do not admit the existence of any other cause capable of producing the disease.

As we wish to meet both these views of contagion, the following facts shall be arranged under two heads: Those which prove that the Yellow Fever of 1822 was not contagious in the pure air of the country: Those which prove that it was not contagious in the vitiated and impure air of our city.

I. *Facts and Arguments which prove that the Yellow Fever of 1822 was not contagious in the pure air of the country.*

(*a.*) From the official returns of Dr. Joseph Bayley, Health Officer of the port, it appears that during the prevalence of the Yellow Fever in this city during 1822, seventy persons sick with that disease, were sent down to the Marine Hospital,* on Staten Island. Of this number, thirty-seven died, eighteen of whom had black vomit. The first of these patients was received into the hospital on the 13th of August, and died on the 15th. From that period until the final cessation of the fever, patients were almost daily carried down to this place.† These cases were regularly attended by the physicians and nurses of the establishment, not one of whom became affected with the disease, nor has a single case come to our knowledge of any person taking it, who was engaged in transporting the sick from the city to the hospital.

* Situated at the Quarantine establishment, about six miles below the city of New York, on the west side of the bay.

† A History of the proceedings of the Board of Health of the city of New-York, in the summer and fall of 1822; together with an account of the rise and progress of the Yellow Fever, which appeared during that season, and the several documents in relation to it, which were laid before the Board. Published by order of the Board of Health. New-York, 1823. p. 132.

The bare statement of the foregoing fact, would seem almost sufficient of itself to settle the question, that the Yellow Fever of this season was not contagious. Aware of its important bearing, the advocates of contagion have displayed no small share of ingenuity in endeavoring to weaken, if not wholly to destroy its force. One of the most strenuous and zealous of these, without denying the fact itself, endeavours to account for it in the following manner. "Of those taken to the Marine Hospital, at Staten Island," says he, "it may be remarked, that they were removed successively at distant intervals, and but two or three at a time, and therefore never accumulated. As the wards also of this spacious building, were kept in the most perfect cleanliness, and from the healthy situation of the building, exposed to the sea, are more roomy and airy than are to be found in most other hospitals; and as there were also but few or no persons sick in the house of other diseases, during the whole of the epidemic, there was nothing for the contagion to operate upon. There are but two physicians attached to it, the Health Officer and Dr. Harrison; and no person was allowed to have any communication with the sick, but the three or four nurses of the establishment, who, like the physicians, had been long habituated to the care of Yellew Fever patients, and were therefore less liable to take the disease, especially in the diluted condition in which the poison must have existed in the airy rooms of this fine building. Their effects, of course, were not allowed to accompany them."*

Now this explanation is equally unfortunate and unsatisfactory in point of fact as well as of argument. Let us briefly analyze it. In the first place, this writer tells us that the patients were removed to Staten Island at "*distant intervals*" "and therefore were never accumulated." It is difficult to ascertain what precise meaning is attached to the word "distant," as applied to periods of time; but it is fairly to be presumed that something longer than twenty-four hours is intended. An interval of no greater length than this cannot cer-

* An account of the Yellow Fever, as it prevailed in the city of New-York, in the summer and autumn of 1822. By Peter S. Townsend, M. D. 1823, p. 383. This work contains a very full account of the disease, and embodies every thing that can be said in favour of its contagious character.

tainly be considered as very "distant." If so, then this statement is not correct as a matter of fact. This stands proved by the official report of the health officer. From an analysis of this document, it results,

1. That the whole period during which patients sick with yellow fever were admitted into the hospital, was sixty-eight days; and during this time seventy persons lay sick in it.

2. That of these sixty-eight days, there were thirty on which no patients were received; on the remaining thirty-eight, from one to five patients daily were admitted.

3. That the greatest interval which elapsed between the admission of any two patients was eight days. This happened at the first breaking out of the fever in the city; towards its close, in the month of October, an interval of five days; and still later in the same month, another interval of seven days occurred. Of the other intervals, there were two of two days, and six of only a single day.

4. That during the whole sixty-eight days, the hospital could never have been entirely clear of patients; and that frequently there must have been from ten to twelve persons sick at one and the same time.

5. That from the 23d of August the 30th of September, a period of only thirty-six days, there were not less than fifty-six patients admitted.

On this analysis we deem it unnecessary to make a single comment. Every reader can judge for himself what those "distant intervals" were, which prevented the pretended contagion of yellow fever from taking effect.

But let us look at this argument in another point of view. Dr. T. asserts, that there were not a sufficient number of patients "accumulated" in the hospital to enable the contagion to develope itself. Now, if seventy patients lying sick in the same place, within two or three months, be not a sufficient number to develope contagion, how can it be contended with any sort of consistency, that less number, under similar circumstances, will produce this effect? And yet such is the fact with regard to this writer. In another part of his work which he devotes to contagion, he adduces several instances of what he calls "examples of the contagious nature of yel-

low fever,"* in which it appears that most of these supposed cases of contagion resulted from intercourse with a *single individual* sick person. Indeed, almost every one of his examples is of this character.

From all this, the dilemma is inevitable. Either the seventy patients at Quarantine were abundantly sufficient to produce contagion, if any such appertained to the fever, or the whole of Dr. Townsend's cases of contagion fall at once to the ground. It is useless to urge a difference of circumstances in the two cases. Dr. T. has shut himself out from the benefit of such an exaplanation by boldly maintaining the unqualified contagion of the disease. In the very second page of his work, he announces this doctrine. "Had not," says he, "however, the late interesting discoveries of the Spanish and French physicians, concerning the laws of yellow fever, proved past all doubt that the theory of domestic origin, and of local filth, is utterly inapplicable to tropical as well as to northern latitudes, *and that this disease to all appearance pursues its course, independent of what in common language is understood by a pure or impure air*, we should have had more reason to wonder than we now have, that it began in the part of the town where it did."†

It is unnecessary to add any thing further on this head. It is self-evident, that as it regards the *number* and *accumulation* of patients, it is scarcely possible for them to have existed to a greater extent than they did at Quarantine. The total absence of contagion in this place, must therefore be attributed to other causes. Let us see if any such existed.

In the concluding part of the paragraph we have just quoted, Dr. T. assigns three additional reasons why the disease did not prove contagious at the Quarantine Hospital, viz: the cleanliness and airiness of the situation, the want of subjects upon which the contagion might operate, and lastly, the insusceptibility of the attending nurses and physicians. We shall, very briefly, take each of these in order. And first, of the cleanliness and airiness of the place preventing the ope-

* Account of the yellow fever, &c. p. 12.
† Account of the yellow fever, p. 18, 19.

ration of contagion. We presume no man will deny, that if this cause could prevent the developement of a contagious character in the yellow fever at Quarantine, the same cause must produce the same effect in all other situations similarly circumstanced. This is plain and evident to the commonest capacity. Now it happens rather unfortunately for this writer, that almost every page of his work supplies us with attempts on his part to prove contagion in the very places which he has shown to be pre-eminently distinguished for their beauty, cleanliness and salubrity. Let us take, for instance, his description of the part of the city where the fever prevailed. "The situation of this part of the city, near the promenade of the Battery, and fronting the Hudson, the bay of New-York, the Narrows, and the ocean, together with the spacious and airy avenues of Broadway and Greenwich-streets, which run longitudinally through it, and near and parallel to each other; and the open, unprotected position of the store-houses which stand on the wharf, expose *the whole of this beautiful quarter of the city to constant ventilation, from all the cooler and purer winds of the horizon, and such as at the same time are the prevailing winds of our climate; the cold north and northwest, rushing down the Hudson from the Highlands, and the southwest and southerly breezes, which every afternoon of summer sweep up from the ocean through the Narrows, and coming directly off the bay, render the air here always cool, agreeable, and refreshing.*"* "The wharf," in this part of the city too, "is substantially built, and being of the nature of a long quay, which runs parallel with the stores, and with but few recesses or projecting piers where filth might collect and become stagnant, as it does in the irregular slips on the east side of the town; *the current of the river freely and constantly washes by it, and keeps it always clean.*"† Again: "the yards of the houses in this part of the city, in correspondence with the buildings to which they belong, *are almost without a single exception, clean, airy and spacious, and enriched and ornamented with trees and shrubbery.*"‡ Again: "from the extensive and beautiful promenade of the Battery on the bay,

* Account of the yellow fever, &c. p. 18 † Ibid. p. 20. ‡ Ibid. p. 20.

at the termination of Broadway and Greenwich-streets, to Rector-street, which may be considered the northern boundary of the district we have been describing, *this whole section is in no part of it in the least degree cramped or confined.* Much the greatest portion of ground included within these limits is occupied by the streets which traverse it, to say nothing of the large open space comprised in the yards, particularly those in the rear of the houses in Broadway, on the side of Greenwich-street."*

Can language be stronger, or description more vivid, to prove the entire conviction of the writer, that this spot possessed in the highest perfection every advantage which could be conferred upon it by situation, cleanliness and unceasing ventilation from cool, pure and refreshing winds? And yet notwithstanding all this, this is the very spot upon which Dr. Townsend locates his contagion, and where it displayed, according to him, its most terrific powers; and not merely so, but he urges these very local advantages as a proof of the disease being contagious, inasmuch as there existed no local causes to which it could be attributed. It comes, therefore, with rather an ill grace from him, to contend that there was too much pure air and ventilation, forsooth, at the Quaran-rantine Hospital for contagion to exist, when he urges these very circumstances as a proof of the introduction and subsequent propagation of the disease in the city, being the result of contagion alone.

The want of subjects upon which the contagion might operate, is another reason, according to Dr. Townsend, why it did not exhibit itself at Quarantine. It is impossible to say precisely how many persons had communication with the hospital. Dr. Townsend asserts that there were none except the two physicians and three or four nurses belonging to the establishment. This must, however, be incorrect. Besides the persons employed in conveying the sick from the city, there must have been others engaged to assist in carrying them from the wharf to the hospital. Dr. Bayley, in one of his letters to the Mayor, also speaks of a steward and an orderly man,

* Account of the yellow fever, &c. p. 21.

as being attached to the hospital, and generally assisting in this business.* Besides, deaths were continually occurring, and an additional number of persons must necessarily have been employed for burying the dead bodies. In addition to all this, there were several patients sick of other diseases in the hospital during the epidemic; so that there must have been, from the very nature of the case, a considerable number of persons who had communication with the sick—a number, at all events, large enough abundantly to test the principle of contagion.

We come now to the last reason assigned by Dr. T. why the Yellow Fever did not prove contagious at the Quarantine Hospital, and that is, that as the nurses and physicians "had long been habituated to the care of yellow fever patients, they were therefore less liable to take the disease." We fear Dr. Townsend will not be borne out in this statement by facts. What proof is there that the physicians and nurses were less susceptible of taking the disease than other persons? Is the simple fact of their exemption to be considered as a proof? Certainly not—because that takes for granted the very point in dispute, viz. that the disease is contagious. And yet, we suspect it would be very difficult to find any other proof of this assertion. But if the attendants upon the sick were unsusceptible of the disease, when and how did they become so? If they were so in reality, after having attended twenty, thirty, or forty patients, they certainly could not have been so when they commenced their attendance upon the *first* patient of which they took charge. *Then*, at least, they must have been as susceptible as all other persons, and yet even *then* we do not hear of their taking the disease. But let us look at the broad fact itself. Is it true, that attendance upon those sick with Yellow Fever, however long continued, will give a person an immunity from the disease, if exposed to the proper cause which produces it? We answer, no,—and appeal in proof to notorious facts which have occurred in the history of the Quarantine establishment itself, where not less than five out of seven of the physicians appointed to that sta-

* History of the Proceedings of the Board of Health, &c. p. 63.

tion, have been seized with this disease, and four have actually fallen victims to it; and this too after a long seasoning, when, according to Dr. Townsend, they should have been for ever protected from its assaults.

(*b.*) We now proceed to state the second fact in proof of the non-contagious character of the Yellow Fever. At the distance of about three miles from the city, at Kip's Bay, a spacious two-story dwelling house was provided at the public expense) for the reception of such of the inhabitants from the infected district as were unable to provide a refuge for themselves. From the official account* given to the Board of Health by the attending physician, Dr. Drake, it appears that during the season ten persons lay sick of Yellow Fever in this establishment, two of whom died. Of the physicians and nurses in attendance, not one contracted the disease. But to render the facts connected with this building still more conclusive, it is stated that "besides the above sick, the house was occupied, during the unhealthy season, by the family of Mrs. Roberts, consisting of four persons; the family of Mrs. Thompson, of eight persons, and three children of the Coit family; all of whom continued in good health, with the exception of two children of Mrs. Roberts, and two of the young Coits, who suffered from intermitting fever, which was doubtless to be attributed to the low wet grounds in the neighbourhood of the house."†

(*c.*) During the prevalence of the fever, six persons lay sick of it at Greenwich, a village about a mile from the city. All of these had contracted the disease in the infected district. Five of the six died. In no instance did they communicate the disease to physicians, nurses, attendants or friends. To give additional weight to this fact, it should be recollected, that to this place had been transferred the seat of business—that in consequence of this, almost all the merchants of the city had retired to it, and that to accommodate them, hundreds of temporary buildings had been erected. From this influx of inhabitants, it may naturally be inferred that the village

* History of the Proceedings of the Board of Health, &c, p. 130.
† Ibid, p. 132.

was crowded to excess; and from this circumstance, as well as the want of comfortable accommodations, every thing seemed favourable to the propagation of the disease. Still, although a number of very decided cases of the fever were carried to this place, lay sick, and died there, it was not, in a single instance, communicated. It only remains to add, that the body of one of the patients who died here was dissected by two physicians, Drs. Donaldson and Torrey, neither of whom suffered from it the slightest indisposition.

(*d.*) In addition to the cases already recorded, there were a large number of persons, who, after having contracted the seeds of the disease in the city, had the disease developed in them after their removal into different and distant parts of the country. There occurred about thirty-six cases of this sort, and at the following places, viz. three at Newark, N. J.; one at Harlaem; three in the city of Jersey; one at Tappan, N. Y.; six at Bloomingdale; one at Albany; three at Middletown-Point, N. J.; four in different parts of New-Jersey; one at Newtown, L. I.; one at New-Canaan, Conn.; two at Amboy, N. J.; one at Hempstead, L. I.; one in Westchester; one at Bloomfield, N. J.; one at Woodbridge, N. J.; one at Saugatuck, Conn.; two at Bushwick, L. I.; two at Elizabethtown, N. J.; and one at Boston. Of this number there were twenty-seven deaths. From the very extraordinary proportion of deaths among these cases, it is evident that they must have been very decided and malignant in their character, and yet in not a single instance was the disease communicated. In relation to the case at Boston, we have the recorded testimony of the editors of the New-England Journal of Medicine and Surgery, who state that the patient "lodged at one of the largest hotels in that place, filled at the time with persons from all parts of the country, and there sickened and died of the Yellow Fever;" and although "he was constantly watched and attended in a small and badly ventilated apartment, no one was in the slightest degree affected by his sickness."*

Let us now pause and reflect upon the amount of testimony

* New-England Journal of Medicine and Surgery, vol. xii. p. 384.

already advanced. It appears then, from the foregoing facts and statements, that upwards of one hundred persons, sick of Yellow Fever, (about one-fourth of all the cases,) lay in different parts of the country, without, in a single instance, communicating the disease. If it had been previously proposed to settle this question by actual experiments, we cannot conceive that any could have been suggested which would have been more satisfactory to all parties, than the very ones which actually transpired during the summer and autumn of 1822. That one hundred persons, sick of a disease highly malignant and contagious, located in different parts of the country, should not, even in a solitary instance, have communicated it to a second person, seems to us literally impossible; and we believe, that were it not for the influence of preconceived opinions, and long-cherished theories, facts of this sort would come home to the mind of every man with a force perfectly irresistible. Aware of these facts, the contagionists, so far from abandoning their favorite theory, have invented new schemes for upholding it. One of the most popular of these at present, is this, that Yellow Fever, although it may not prove contagious in the pure air of the country, yet is eminently so in the impure atmosphere of cities, &c. Whether any countenance was given to this doctrine, by the facts which were developed during the Fever of 1822, we now propose to investigate.

II. *Facts and arguments which prove that the yellow fever of* 1822 *was not contagious in the impure air of the city.*

Before entering upon these, we cannot refrain from first making a few remarks upon the theory itself, which asserts that a disease may be contagious in one sort of air, and not so in another. Notwithstanding this doctrine has received the sanction of some very distinguished names, we have never been able to convince ourselves that it is correct in fact, or philosophical in principle. That it is not correct in fact, so far as it relates to yellow fever, we shall show directly. The grounds upon which it is conceived to be unphilosophical, are these.

If contagious effluvia emanate from the body of a person sick of a peculiar disease, they can be influenced by the surrounding air only in one of two ways. First, the surrounding air may serve simply as a medium of transmission. In this way the effluvia are diffused more widely than they would be in vacuo. It is evident, however, that here the contagion remains unchanged in its character, and produces its specific effects without any aid from the atmosphere, except that of enabling it to act at a greater distance from the sick body. Second, the contagious effluvia may enter into chemical combination with the surrounding atmosphere. An entirely new compound then is formed, the effects of which upon the human system must necessarily be different from those of the original contagion.

These are the only possible methods in which contagious effluvia can be influenced by the surrounding atmosphere. Now, if we apply these propositions, and push them to their conclusions, they will be found to destroy completely the theory of which we are speaking. If the contagious effluvia enter into chemical union with the air, and form a new poison, then the same specific disease cannot be reproduced: this supposition, therefore, is inadmissible. If, on the other hand, the air serves merely as a medium for transmitting the poison to a greater distance, then no reason can be assigned why, if you approach near enough to the sick body, contagion should not display itself in a pure as well as an impure atmosphere.

Let us take another view of the subject. If a disease be contagious in one kind of air, and not in another, then it must acquire its contagious character from some peculiarity in the air in which it is so; and if this be the case, then the principle of contagion must exist in the air, and no reason can be assigned why the air itself should not, under these circumstances, produce the disease, independently of all sick and diseased bodies. This seems to us to be an inevitable conclusion from the premises; and to our minds, it appears most satisfactorily to do away the necessity of resorting to contagion to account for the origin and propagation of yellow fever. On these grounds, we think the popular doctrine which supposes that

this disease may be contagious in one species of atmosphere, and not in another, is unphilosophical.

But we wish not to rest this subject on abstract reasoning alone. We shall again appeal to facts, to prove that in the impure atmosphere of our city, the disease was as destitute of any contagious property as it was in the country. And for the purpose of covering the whole ground, we shall first state those which establish this in those parts of the city which were considered as uninfected, and afterwards those which establish it in the infected parts of the city.

(*a.*) *In the uninfected parts of the city.* It is difficult to ascertain precisely the number of persons that lay sick of the fever, beyond the limits of the infected districts. Dr. Townsend estimates them at one hundred and four. Admitting this to have been the whole amount, although it probably was larger, we would ask, was a single one of these known to have communicated the disease to a second person? That there was not, is a fact so notorious, that even Dr. Townsend, with all his zeal for contagion, is forced to admit it. That there may be no evasion on this subject, we shall quote his own words: "Out of the one hundred and four persons," says he, "sick of yellow fever in the uninfected parts of the city, sixty-five out of this number did not reside in the infected district, but had been employed there as labourers, or merely passed through it. These, therefore, could have brought neither dirty clothing nor any other infected articles with them. Why these, however, and the remaining thirty-nine scattered over various parts of the city, supposing some of them to have brought their bedding or clothing with them, *did not communicate the disease to their physicians, nurses, or attendants, or to the inhabitants living in the neighbouring houses, it is perhaps impossible to say.* I will not deny, that *several* of these cases, from the *confined situation of the apartments in which they lay,* and the inattention of their nurses, *seemed to have been placed under circumstances particularly favourable to communicate the disease.* But it must be remembered," adds our author, "that all these were individual cases, and more or less insulated, not only by being placed in parts of the city remote from each

other, but because they were in a great number of instances abandoned through fear by their relatives as well as friends, by all indeed but their physician, and some desperate fellow whom cupidity more than philanthropy tempted to do some few reluctant services to the forsaken sufferer."*

Let us now look for a moment at the concessions and admissions which are contained in the paragraph just quoted. In the first place, it is admitted that one hundred and four persons sick of yellow fever, and lying in various parts of the city, *did not communicate the disease to their physicians, nurses or attendants, or to the inhabitants living in the neighbouring houses.* In the second place, it is admitted that *several of these cases were placed under circumstances peculiarly favourable to communicate the disease.* Is it possible for admissions to be more ample, and at the same time more fatal to the cause of contagion? As if conscious of this, Dr. T. immediately after attempts to explain them away, by asserting that the cases were individual ones, and remote from each other, and that they were in a great number of instances abandoned by their friends. With regard to the cases being individual ones, it is hardly worth notice after what has been stated in a previous part of this paper. Almost every one of Dr. T.'s instances of contagion, he attributes to communication with single individual cases. Upon his own ground, therefore, an individual case is quite abundant to propagate the disease. We cannot then permit him to contradict a principle in the present instance, which he has already assumed, and which forms the basis of a large portion of his reasoning. As to the abandonment of the patients by their friends, we can only say, that although we remained in the city during the whole of the prevalence of the fever, and were in the daily habit of visiting persons sick with the disease, we do not recollect to have met with a single case in which a patient was left in this state of helpless and hopeless abandonment. On the contrary, several instances fell under our immediate observation, in which the most honourable and disinterested devotion in administering to the wants and comforts of the sick, was displayed even by

* Account of the Yellow Fever, &c. p. 65.

persons not conneeted with them by the ties of blood or relationship. Besides, what shows conclusively that such abandonment of patients labouring under the fever, could not in the very nature of things have existed, is the notorious fact, that every patient who, either through poverty or any other cause, could not eommand the attentions necessary in his case, was provided for at the public expense; and it was only those patients whose friends were both able and willing to take eare of them, who remained in the city. The causes assigned, therefore, for the absenee of eontagion in these cases, are evidently insufficient.

We shall now proeeed to show, that in many of these eases admitted not to have proved eontagious, there was every attending circumstanee required by the eontagionists themselves, to favour the development and operation of this supposed property of the disease; and in doing this, we shall not advance a single fact whieh we did not ourselves witness, or for whieh we have not the very best authority.

Joseph Dykeman, a coloured man, who had frequented the infected district, without, however, we believe, visiting a single person labouring under yellow fever, was seized with this disorder on the 23d of August. He lay sick in Walker-street, a few doors from Broadway, in a low, confined and damp cellar, where it seemed almost impossible that the fresh air of heaven eould ever find its way. On the 28th, in company with several other physicians, we visited this man, and found him in the agonies of death. The most aggravated symptoms charaeterized this ease, and at this time his eyes were fixed, his pulse was gone, his extremities were cold, blood was oozing from his mouth, and on pressing the region of the stomaeh, he seemed convulsed with pain. Notwithstanding all this wreck of the physical powers, the mind still retained its supremaey; and on being requested, he put out a elean and blood red tongue. In a few hours after this, he expired. Notwithstanding the malignity of this ease; notwithstanding the patient lay in a elose, ill-ventilated and filthy eellar; notwithstanding he was regularly attended by two physieians, and occasionally visited by numbers of other physieians, as well as strangers;

notwithstanding his family remained with him, took care of him during his sickness, and continued to inhabit the same place after his death; notwithstanding one of the women had actually washed the clothes in which he died: notwithstanding all this, not a single person ever became indisposed from communication with him.

E. Jackson, who had been in the infected district, was taken sick on the 27th August, and lay in a small, confined room in Chamber-street. She died on the fourth day of her disease, with decided black vomit. This person, although constantly nursed by two or three women, and visited by numbers of physicians, did not communicate the disease to a single person. We attended this woman, and visited her three or four times a day, remaining sometimes half an hour at a time, without experiencing the least inconvenience.

Mary Ann Ragan, an interesting young girl, was reported sick of yellow fever on the 13th September. She had lived in the infected district, but had not been near any sick person. After sickening, she was removed to No. 2 James-slip, where she died with black vomit on the fifth day after her attack. Here this patient lay in one of the filthiest parts of the city—in the vicinity of a wharf—the very location considered by the contagionists as most propitious to the developement of contagion—in an apartment extremely close and uncomfortable, and scarcely large enough to contain six persons—she was attended night and day by her mother—visited daily by physicians from the Dispensary, as well as by others, and yet no communication of the disease took place in a single instance.

Alexander Benthousen, contracted the fever on the 14th of September, in consequence of working in the infected district, without, however, having had communication with any sick person. He lived in Church-street, and lay sick there, in a low, small, and dark cellar. He was attended by his wife during the whole of his illness, and was regularly visited by several physicians, none of whom suffered the least inconvenience in consequence of it.

Mary Tirnan took the disease in the infected district, and was afterwards removed to No. 66 Cross-street, where she

died. In the room adjoining to the one in which she lay sick and died, two families lived crowded together. After the death of the patient, none of them deserted the house; and on calling there several days afterwards, we learned that none of the clothes of the deceased had been destroyed, but, on the contrary, that one of the women had washed them with perfect impunity. Not a single inhabitant in this house nor any person who visited this patient, took the disease.

James Kewin was reported sick of yellow fever, on the 8th September, and died on the 15th. He lived in the infected district, where he took the disease, and was afterwards removed to No. 8 Thomas-street. It was here that we saw him on the day on which he died. On entering the apartment, we found him with cold extremities, pulse scarcely perceptible, and lying in a state apparently comatose. On speaking to him, however, in a loud tone of voice, he raised himself up, glared his eyes around, and then fell back in his bed without uttering a single sound. About two hours after this he expired. The place in which this patient lay, was a small and confined room, in the rear of another building. He was attended by a couple of females, neither of whom took the disease, nor did any of the physicians who attended or visited him.

James Macginnis was reported sick of the fever, on the 24th of August, at 123 Greenwich-street, and died on the 25th. During the three first days of his illness, his brother slept in the same bed with him, and afterwards attended him faithfully until he died, without suffering any ill effects. A reverend clergyman, who saw Macginnis frequently in the course of his sickness, escaped the disease, as did also all the physicians in attendance.

Mary Morris, reported on the 8th of September, and died on the same day. She had been taken sick in the infected district, but had not been near any person labouring under the disease. She was removed to Desbrosses-street, and lay in a small back apartment, where we visited her. She had a nurse who attended her constantly. Neither nurse, physician, or any other person contracted the disease from this case.

In addition to the foregoing, two persons sick with yellow fever were carried to the New-York Hospital, and died there, and yet neither nurses, physicians, nor any other person, took the disease, although the wards in which they lay were filled with other patients.

It would be perfectly easy for us to go on and extend this list of cases to an almost indefinite length; the materials for so doing we have in our possession, collected at the time with every regard to truth and impartiality. We believe it, however, to be unnecessary, and shall therefore merely state in general terms, that we do not know of a single instance in which individuals lying sick with the disease, in any part of the city, however filthy or uncomfortable, communicated the same to a second person; and we do most sincerely believe that no such case did occur.

(*b.*) *In the infected parts of the city.* We come now to the infected districts, and notwithstanding Dr. Townsend's attempt to show that the disease was equally contagious under all circumstances, it is here after all, that he makes his principal stand in defence of contagion. It is here in fact that all the contagionists are obliged to take refuge, or abandon their doctrine altogether. Let us see whether it can be defended with more success here, than in other places. For the purpose of simplifying the subject, we shall first state the question at issue. The contagionists assert, that after the first cases of the disease at Rector-street, every subsequent case was the result of some communication with those already sick; and that as cases multiplied, the air itself became so impregnated by the contagious exhalations, from sick bodies,* as of itself to produce the disease in those exposed to it, without immediate or direct connexion with the sick. The non-contagionists, on the other hand, assert that the disease did not spread in consequence of any communication with the sick, and that the infection of the district was owing to other causes than exhalations from those sick of the fever.

From this statement it appears that both agree in one thing,

* "It is the sick who infect the air, not the air that infects the sick." Townsend's Account, etc. p. 111.

"The air is in no other way infected than by the emanations from the sick." Ibid. p. 111.

viz. that the air in a certain portion of the city, called the "infected district," was actually impregnated with a certain poison capable of producing yellow fever, in those exposed to it, without their having any immediate communication with the sick. This being agreed upon, the only remaining question to be solved is this: was the poison, so impregnating the air, and producing such effects, an exhalation from the bodies of those who were sick with the fever, or was it not? If it was, then the contagious character of the disease is established. If it was not, then the disease cannot be considered as contagious.

Our reasons for believing that the contamination of the air was not owing to any exhalations from the sick, are the following.

1. It has already been shown, that not merely in the pure air of the country, but even in the most impure and unhealthy parts of our city, patients sick of the yellow fever, in 1822, were uniformly approached with perfect impunity. The *air*, therefore, in the infected district, must have been much more venomous than the contagious poison itself, coming off directly from diseased bodies. That is, the poison diluted in atmospheric air, must have been more powerful than the pure, unmixed poison itself. A proposition, absurd in itself, and contrary to all analogy. We infer, therefore, that as the *air* of the infected district was more deleterious than actual contact with the sick, the poison existing in the air must have been some other than effluvia from the bodies of the sick.

2. If the infection of the air depended upon emanations from the sick, then it should have extended *pari passu* with the sick and the dead. That this was not the case is notorious. That it was not so out of the infected district, is proved by the fact, already established, that no case of communication was known; and that it was not so in the infected district, is equally evident from the circumstance, that the limits of the district were only known and defined from persons being taken unexpectedly sick, without, in many instances, any sort of intercourse with those already affected.

3. The gradual and measured extension of the limits of in-

fection, proves conclusively that it must have originated from some other cause than contagion. So regular was this extension, that attempts were made, and with apparent success, to calculate its daily progress. From the point at which it first commenced, it extended very nearly to equal distances in all directions. Can any man, of common reflection, contend that such an effect could follow from patients scattered in different directions?

4. But what settles this beyond peradventure, is the fact, that by far the largest number of the sick did not lie in the infected district at all. From the official list published by the Board of Health, it appears that in all, not more than about one hundred and thirty lay sick in the infected districts during the whole of the prevalence of the fever, while about one hundred and seventy-two lay sick in different parts of the rest of the city. As therefore one hundred and seventy-two patients did not infect the air in which they lay sick, it is reasonable to conclude, that a *less* number would not produce such an effect, and therefore that the infection of the district was not owing to the sick.

From all these reasons, we conclude, that the infection of the air was not owing to contagious exhalations from the sick, but to some other cause. What this cause was, it is not our business at present to inquire. That it was a gaseous poison, is evident—that it was permanent in its action is also clear from its gradual extension until the appearance of frost. Whence or how it originated, is a question very far from being settled, the investigation of which we may perhaps take up at some future period.

After the general facts and arguments which have been advanced in support of the non-contagiousness of yellow fever, it might be deemed almost unnecessary to urge any thing further on the subject, were it not to notice one or two arguments that have been very largely insisted upon by Dr. Townsend in defence of the doctrine of contagion. As far as we are capable of analyzing this writer's diffuse method of reasoning, he appears to rest principally upon the following: First, the fact (as he asserts it to be) of a *number* of cases

occurring in individual houses; and second, that these cases did not occur simultaneously, but in succession and at determinate intervals.

In support of the first of these arguments, the following statement is given:—"From whence it appears, that out of about four hundred and twenty-two cases, the total number this season, two hundred and ninety-five, or very nearly *two-thirds*, occurred in *eighty-six houses*, all of which were either opposite to or adjoining each other, or contained each from two to eight cases. What is still more worthy of remark, *two hundred and seventy-six* of the whole number of cases occurred in *sixty-seven* houses, and each one of these sixty-seven houses furnished from two to eight cases, and out of these same two hundred and seventy-six cases, one hundred and four died; that is nearly *one-half* of the whole number of deaths of yellow fever on the records of the Board of Health! This accumulation of cases in particular houses appears in a still more striking light when we call to mind that out of the remaining one hundred and forty-six cases, which did not occur together in the same houses, sixty-five were persons who resided in uninfected parts of the city or in the country, and caught the disease by exposing themselves to those places in the lower part of the city where many persons had sickened. Thus, out of four hundred and twenty-two, the whole number this season, there remain but eighty-one cases which did not occur in the number of more than one or as many as eight in the same house; or, in other words, there were but eighty-one cases which occurred singly in different houses."*

Without calling in question the accuracy of this statement, we assert that it by no means proves the existence of contagion.

1. Because all the cases alluded to occurred in the infected district, where every person was exposed to the same *common cause* which produced it in the first patient. Under such circumstances, the fact of half a dozen persons sickening in one house does not prove contagion any more than it does their exposure to the same general cause, producing the same ef-

* Account of the yellow fever, &c. p. 115.

fects upon each. When, however, it is recollected that in houses where the sick lay in the city *beyond* the infected district, no such fact was known to occur, the conclusion is not only legitimate but inevitable, that when it did occur in the infected district, it was not owing to contagion.

2. Another very satifactory reason why so large a number of cases occurred in a comparatively small number of houses is, that almost all the houses of the district were deserted by their former inhabitants. In some streets not a single one remained inhabited; in others, only one or two. It is evident, then, that if any cases occurred at all, they must have taken place in those solitary buildings which were occupied. If this general and almost total desertion of the district had not taken place, victims to the disease would have been found without difficulty in almost every other house.

3. Because persons inhabiting the same house, from equal predisposition, equal exposure, and similar modes of living, were most likely to be similarly affected by the common poison pervading the atmosphere; hence it was to have been expected, if one was seized with the disease, others in the same house would also be liable to it.

As to the *second* argument, viz: that numbers of cases occurred *in succession*, we answer that it does not prove contagion:

1. Because, even admitting it to the fullest extent contended for, the simple fact of succession is no test of a disease being contagious. This we think may be proved satisfactorily by a very simple and obvious illustration frequently occurring. Suppose a person living in the neighborhood of a marsh, is seized with bilious remittent, a disease universally admitted not to be contagious: he is visited by a friend, who continues with him, and attends upon him during his sickness. In a few days, this friend finds himself beginning to sicken, and is also taken with bilious remittent fever. Now, here we have actual communication with the sick—precisely the same disease reproduced—and the one taken *in succession* to the other. What more can be wanting to make out a case of contagion? And yet all this apparent proof, conclusive as it ap-

pears, amounts to nothing. It merely proves, that *both* patients were exposed to the influence of the miasms from the marsh, *the common cause* producing precisely similar effects in both.

2. Because the fact of persons taking sick in succession may be explained satisfactorily without resorting to contagion. It is admitted on all hands that certain states of the system predispose persons to be acted upon by the poison of yellow fever. The depressing passions have uniformly been considered as producing this effect. Hence cautions on this subject are laid down by almost every practical writer. Now, we cannot imagine any situation more truly depressing, or one more calculated to excite fear and anxiety than that of a family remaining in a pestilential district, and accordingly none more likely to prepare the system for being assailed by the disease. More especially would all this be the case, if one of the members of a family thus situated were taken sick, and it would rather be a matter of surprise than otherwise, if with all these predisposing and exciting causes operating upon them, persons did not take the disease.

On these accounts, we think that the fact of persons taking the yellow fever in succession, even admitting it to the fullest extent contended for, does not prove any thing in favour of contagion.

We have now finished what we proposed doing in the commencement of this article, which was to present a summary of the facts and arguments which have induced us to believe that contagion had nothing to do in the propagation of the yellow fever as it appeared in this city in the summer and autumn of 1822. How we have succeeded, must be left to the judgment and decision of the reader.

IV.

ON THE USE OF MERCURY IN ONYCHIA MALIGNA.

There is a species of Onychia not commonly described in the books, of which Mr. Wardrop of Edinburgh has furnished a very accurate account,* and to which, from the obstinacy and malignity of its character, he has given the appropriate name of Onychia Maligna. In the treatment of this affection he remarks, that the only local means which he had found to relieve the patient, were the evulsion of the nail and the subsequent application of escharotics to the ulcerated surface. Even this treatment, painful as it is, seldom succeeds, and the patient is after all obliged to submit to amputation. In consequence of the great intractability of this troublesome complaint to the methods in ordinary use, Mr. W. was induced to try the effects of mercury given internally. The success of the experiment seems to have been perfect. As soon as the system became affected by the mercury, the ulceration assumed a healing appearance, and the bulbous enlargement gradually subsided. Mr. Wardrop concludes his remarks by stating, that "how far this treatment may be found successful in all cases of this disease, can only be determined after considerable experience. I am persuaded, however, that there are cases wherein it will be found an efficacious remedy." Believing the treatment suggested by Mr. W. to be a very valuable and important improvement in relieving a serious malady, I have thought it advisable to confirm its safety and efficiency by the record of a few cases which have oc-

* An account of some diseases of the toes and fingers, with observations on their treatment. By James Wardrop, Esq. of Edinburgh. (London Medico-Chirurgical Transactions, vol. v.)

curred in my own practice, and that of some of my friends. I am induced to do this more particularly at the present time, because I have reason to believe that the practice is not generally known in this city. At any rate, I had the mortification of finding, not long since, in the case of a little patient whom I was treating in this way, and with every prospect of success, that one of our surgeons who had been consulted without my knowledge, had actually amputated the finger before my next visit!

The origin and progress of this disease is so accurately described by Mr. Wardrop, that I shall make no apology for introducing it. "The commencement of the disease is marked by a degree of swelling of a deep red colour of the soft parts at the root of the nail. An oozing of a thin ichor afterwards takes place at the cleft formed between the root of the nail and soft parts, and at last the soft parts begin to ulcerate. The ulcer appears on the circular edge of the soft parts at the root of the nail; it is accompanied with a good deal of swelling, and the skin, particularly that adjacent to the ulcer, has a deep purple colour; the appearance of the ulcer is very unhealthy, the edges being thin and acute, and its surface covered with a dull yellow or brown-coloured lymph, and attended with an ichorous and very fetid discharge. The growth of the nail is interrupted; it loses its natural colour, and at some places appears to have little connexion with the soft parts. In this state," he adds, "I have seen the disease continue for several years, so that the toe or finger became a deformed bulbous mass. The pain is sometimes very acute, but the disease is more commonly indolent, and accompanied with little uneasiness: this disease affects both the toes and the fingers. I have only observed it on the great toe, and more frequently on the thumb, than any of the fingers. It occurs, too, chiefly in young people, but I have often seen adults affected with it."

Of the cases which have come to my knowledge, four were of the age of ten years or under, and one of the age of twenty-three. In one case the disease affected the thumb; in a second the great toe, and in the remainder the fingers. In

no case have I found the patient to complain of much pain. This is a very peculiar circumstance in a disease of so malignant a character; and it may be looked upon as a diagnostic sign between it and the common forms of onychia.

Case I. Decatur Frazer, a boy ten years of age, in July, 1821, ran a small splinter, by accident, under the nail of the right thumb; in a few days the parts about the root of the nail assumed a livid colour, and at the same time began to swell, and afterwards to ulcerate. From this time the swelling gradually increased, and the discharge became more copious and offensive. In this state it continued until about the beginning of January, 1822, a great variety of local applications having been made in the mean time, without the slightest advantage. At this time the little patient was placed under the care of my friend, the late Dr. James Kent Platt, Professor of the Institutes of Surgery in the University of Vermont. The extremity of the thumb had assumed a bulbous appearance, and was about double the natural size. The nail had separated in the middle and was quite loose. The matter discharged from the ulcer was thin and extremely offensive; so much so as to require frequent dressings during the day. There was no pain complained of, except a slight sensation of it whenever the ulcer was cleansed and dressed. Judging it to be a case in which mercury might prove serviceable, the blue pill was commenced with. Several of these were taken, but from the negligence of the parent of the boy, without any regularity. No effect was produced upon the gums, and no improvement visible in the appearance of the thumb. Dr. Platt being obliged to visit the West Indies for the benefit of his health, I was requested to attend the patient. I continued him under the use of the blue pill for a few days, but without any apparent advantage. The mother now became impatient, and declined giving any more mercury for the present. After an interval of five or six weeks I resumed the use of mercury in the form of pills composed of calomel and opium in the proportion of one grain of the former to one-eighth of a grain of the latter, three times a day. In about ten days the mouth became affected, and a pretty free saliva-

tion ensued. Almost instantaneously upon this effect being produced, the ulcer put on a different appearance. In a few days the discharge from it ceased completely, and in about three weeks the whole had healed, and the swelling almost entirely subsided. Between two and three months after this a new nail had grown out, and the thumb has remained healthy and sound to the present day.

Case II. James Reden, aged six years, has onychia maligna on the second finger of the right hand. The end of the finger is much enlarged beyond the natural size; has a bulbous shape, and around the ulcer, is of a livid shining appearance; the nail is loose and the ulceration around it discharges large quantities of fetid matter. The mother supposed it to be owing to the finger being caught in a door. Five weeks after the injury, it began first to inflame around the root of the nail, and the extremity of the finger to swell. There had been no pain in it from the beginning, except when irritated by dressing, &c. Poultices and other local applications had been used to no purpose. In this situation it had remained three months, when application for advice was made at the Dispensary. At my suggestion, Dr. Torrey, to whose district the patient belonged, began the administration of calomel and opium, with the view of producing salivation as speedily as possible. As large doses as the child could bear were accordingly given; in three days the gums were affected, and in three or four days after this the discharge ceased and the ulceration began to heal; the swelling also, gradually subsided, so that in three weeks it was of the natural size, and at a still later period the nail began to grow. The mouth was kept sore in this case about a fortnight.

Case III. In consequence of the success attending the preceding case, Dr. Torrey was induced to have recourse to it in a lady aged about twenty-three, who was troubled with this form of onychia on the great toe. In this case the disease seems to have arisen spontaneously—at least without any known cause. As in the other cases, the ulceration commenced at the root of the nail, and gradually extended around and under the nail, and discharged large quantities of offensive

matter. The toe became very much enlarged in size, and had the bulbous appearance. There was but little pain experienced except in walking. In this condition it had remained about five or six months, during which period poultices and cerates had been very liberally applied.

The patient was now advised to commence the use of mercury. She accordingly took the blue pill, until her mouth became slightly affected by it; the toe assumed at once a different appearance; diminished in its size, and began healing rapidly. As, however, the affection of the mouth had been extremely slight, and the patient had immediately desisted from the use of the mercury, the disease returned again in a few weeks pretty much in its original form and appearance. After an interval of about a month, mercury was again administered, and with precisely similar results. Owing to the prejudices and inattention of the patient, the mercury was again suspended, as soon as the least tenderness was felt in the gums; while this continued, the amendment in the toe was as prompt and decided as before, but as this soon subsided, the disease again returned.

Convinced of the efficacy of the treatment from the relief which she had experienced, as well as of the necessity of continuing the mercury longer than she had done, the patient now submitted herself entire to the direction of her physician. Mercury was again used until slight salivation was produced, which was continued until the disease was completely removed. No symptom of it has returned to this day. The whole continuance of the affection in this case was about nine or ten months.

Case IV. Mary Bolan, aged five years, has onychia on the first finger of the left hand; the nail came out about two months previously to her applying for advice; the extremity of the finger is of a livid colour, and much enlarged; the site of the nail is ulcerated and discharging offensive matter. In this case mercury in the form of blue pill was given, until the gums were affected, when the discharge was arrested and the ulcer healed.

Case V. E—— M——, aged ten years, ran a needle into the extremity of the second finger of the right hand, which at the time caused profuse hæmorrhage, and afterwards degenerated into onychia maligna. The end of the finger was very much enlarged, the discharge from the ulceration copious and very offensive, unattended by any pain. In this state the finger had remained for several months, without being at all improved by a great variety of local domestic applications. On coming under my care, I put her immediately upon the use of the blue pill, which she took for eight or ten days. Before, however, the gums were affected, the mother became impatient and hurried away without my advice or knowledge to a surgeon of this city, who immediately relieved the patient by amputating the finger!

From the very exact resemblance which this case bore to the other cases, which I had seen cured by mercury, I cannot entertain the smallest doubt that the disease would have yielded immediately upon salivation being produced.

The foregoing cases, together with those recorded by Mr. Wardrop, seem to me to furnish very conclusive evidence in favour of the mercurial treatment of this disease. To ensure success, however, the remedy must be properly administered. Judging from what I have seen, the rule necessary to be observed is, to affect the mouth, and to keep up this action until the cure is completed; unless carried to this point I have never seen any good effects from the use of mercury in this complaint.

With regard to local applications, little need be said. In a majority of the cases just related, the ulcers were merely cleansed with soap and water, and dressed with simple ointment. In one case the yellow wash was used, and with advantage. It may not be improper to state that in one of the preceding cases, the patient had previously submitted to the excision of the nail, and afterwards to the application of caustic. This painful operation was performed twice, unattended, however, by any benefit.

V.

HISTORY OF A CASE OF ULCERATION AND PERFORATION OF THE STOMACH, WITH OBSERVATIONS.

In the month of January, 1820, I was requested to visit Mrs. P——, aged sixty years, who I learned had been ill for some months previously. I found her laboring under very decided symtoms of hydrothorax, together with œdema of the lower extremities. The difficulty of breathing was so great, as to render the recumbent posture utterly impracticable. She complained of no pain or uneasiness in the region of the stomach, and was not troubled with nausea or vomiting, although her appetite had in a great measure left her. From the hopeless condition in which the patient was found, it was evident that nothing could rescue her from speedy dissolution. Some medicine, however, was ordered, which she took very readily, and retained on the stomach, as she did also all her drinks and nourishment. No relief was obtained, and she died in a few days after I first saw her.

Dissection. Leave being obtained, my friend, the late Dr. James K. Platt, and myself, opened the body on the morning succeeding the day of the patient's death. In the chest were found traces of considerable previous disease. Extensive adhesions of the pleura to the parietes of the chest had taken place. The extremity of the left lung was indurated, and instantly sunk on being put into water. Within the pericardium and in the cavity of the chest nearly a quart of fluid had been effused. On opening the abdomen, the liver was found in a perfectly sound condition, as were also the pancreas and spleen. Greatly to our surprise, the stomach was discovered

to be the seat of very striking and interesting morbid changes. The whole of the inner surface of this organ presented a highly florid and vascular appearance, and along the lesser curvature there were *five ulcers*, one of which, situated about midway between the cardia and pylorus, had penetrated quite through the different coats of the stomach, and formed a circular hole of about the size of a shilling. The remaining four ulcers were of various sizes, not differing much, however, in this respect, from the one just described. The edges of the ulcers were a good deal thickened, and very smooth. This was more especially the case with the one which perforated the stomach. All of them were surrounded by the vascular appearance already mentioned as characterizing the inner coat. None of the contents of the stomach had escaped into the abdomen. That this had not taken place is to be ascribed entirely to the situation of the perforation. The stomach itself was found to contain about a pint of fluid. It will readily be imagined that the morbid appearances just described were wholly unexpected, as I had not been aware that any symptoms of a diseased state of the stomach had been betrayed before death. With the view, however, of obtaining more accurate information on this point, I inquired minutely into the previous history of the patient, and ascertained that she had been asthmatic, but that she had never complained of pain or uneasiness in her stomach; had never been troubled with vomiting; and that her appetite had remained tolerably good until three or four weeks of her death.

OBSERVATIONS.

Ulcerations of the stomach similar to those which have just been recorded, although not wholly unnoticed by preceding writers, are of so rare occurrence, that their symptoms and causes are as yet very imperfectly understood. Even Dr. Baillie, who has described with graphic accuracy the morbid appearances peculiar to them,* is by no means so full and satisfactory in his account of the symptoms as could have

* The Morbid Anatomy of some of the most important parts of the Human Body, by Matthew Baillie, M. D. F. R. S., p. 90, American edition.

been wished. There is one circumstance especially connected with their history which he has failed to notice; and this is, that they may frequently go to the length even of perforating all the coats of the stomach without having the fact betrayed by a single symptom. The case which I have just recorded proves this in a very striking manner. There was certainly no evidence present before death of any diseased condition of the stomach, and the death of the patient was entirely owing to the dropsical affection of the chest. There is every probability, too, that had she not fallen a victim to this latter disease, she might have lived a considerable time longer, notwithstanding the ulcerations in her stomach. The same general fact is confirmed by the history of several other cases found on record.

That accurate observer, Dr. Pemberton, states that he has often been surprised to find very extensive mischief in the structure of the stomach, without the constitution being sensibly affected by it, provided the mischief was so situated as not to interrupt the passage of the food. In confirmation of this, he relates that he had seen a large schirrus in the stomach, near the pylorus, with an open cancer in one part of it, which had made its way through the stomach, and through the left lobe of the liver; and an adhesion had taken place between the sides of the abcess and the peritoneum; so that, he adds, "had not the patient been taken off by disease in the aorta, I have no doubt but that this abcess would have made its way out through the integuments of the abdomen. Still, however, though this must have been a disease of very long standing, the body was but little emaciated, and the patient *had never shown any symptom by which such a disease of the stomach could possibly have been suspected.*"*

Dr. Crampton, Professor of Materia Medica in Dublin, has favoured us with the history of another case of ulceration of the stomach, succeeded by perforation and the subsequent effusion of the contents of the stomach into the cavity of the abdomen. The patient was suddenly seized with severe pain in her stomach, succeeded by the most agonizing pains in the

* Practical Treatise on various diseases of the Abdominal Viscera, p. 129, Am. Ed.

whole abdomen. These continued without the least abatement until the moment of her death, which took place a very few hours after her first seizure. On dissection, there were found decided evidences of inflammation throughout the whole peritoneum, excited unquestionably by the escape of the contents of the stomach; and to this cause must the death of the patient be attributed. From the appearance of the perforation in the stomach, and other attending circumstances, it seems certain that the disease must have been of some considerable continuance; and yet there do not appear to have been any marked symptoms present by which it could have been detected. All that we are told of her previous history, is, that "she had been subject occasionally to pain in the stomach, as well as in both the hypochondria, but that they generally gave way to medical treatment of a few days."*

To the case of Dr. Crampton, Mr. Travers, of London, has added two or three others, confirming very strikingly the same general fact. In all of the cases related by this gentleman, the patients fell victims to the peritoneal inflammation excited by the effusion of the contents of the stomach; and in every instance, with a single exception, had they enjoyed good health until this effusion took place. I am aware that it may be objected, that as there is no positive evidence of any previous organic derangement, the perforation or rupture of the stomach may have taken place suddenly, without any antecedent ulceration. This explanation, however, is inadmissible. The absence of any adequate cause to produce such a sudden rupture of a healthy stomach, in the cases which have been referred to, as well as the appearances of the ulcers and perforations themselves, render this supposition wholly untenable. Nothing but the existence of a slow and protracted ulceration can at all account for these phenomena. That such ulceration does take place, and that it is followed by the consequences just mentioned, we have the very best possible evidence, even independent of that already adduced.

Mr. Benjamin Gooch, in his Chirurgical Works, details the particulars of a very extraordinary case, in which an opening

* Medico-Chirurgical Transactions of London, vol. 8, p. 228.

was made into the stomach, as the result of a slight external injury received twenty years before. After receiving the injury, it is stated that the patient had transient wandering pains in the epigastric region, but never violent. In this state she remained ten years, when she was seized with an accidental fever, during the continuance of which the pains increased, and a small flat tumour appeared over the bottom of the stomach, without, however, any external inflammation or throbbing, and unattended with any pain upon pressure. At this time she had no complaint in her stomach. When the fever left her, she regained her former health, and continued ten years longer with very slight pains in the stomach and abdomen, but never to such a degree as to be troublesome. At the expiration of that period, she was again attacked with fever, when the tumour became inflamed and enlarged, and finally burst, discharging through the opening the contents of the stomach. After this, she was well enough to go about her ordinary business—"food agreed with her stomach; she had no sickness," and was not costive. She lived several months after this, and died of fever, brought on by an imprudent exposure to cold. On dissection, the stomach, around the orifice, was found adhering to the peritoneum; and by this kind provision of nature, the contents of the stomach were prevented from falling into the cavity of the abdomen.*

Dr. Male, of Birmingham, relates the case of a female, aged fifteen, who had been complaining for two or three days, of slight pain in the bowels, when she was suddenly seized with symptoms of enteritis. Her countenance was pale and ghastly; pulse 150; bowels costive, &c. She expired in a few hours after the attack. On opening the body, appearances of general inflammation were found in the abdomen. "The stomach was empty, and appeared partially inflamed; and in the superior part, near the cardia, was a foramen, nearly circular, about three quarters of an inch in diameter, perfectly smooth and regular; it had not at all the appearance of having been eroded by the gastric juice, or of being the effect of *recent* inflammation. On the opposite side of the same organ was an-

* Gooch's Chirurgical Works, vol. iii. p. 163.

other foramen, nearly of an oval form, not quite half an inch in length, which, however, did not perforate the external coat of the stomach, but had apparently formerly done so, and afterwards became closed, and the edges united by a cicatrix; the other parts of the stomach were perfectly sound."

Dr. Male states, that on inquiry, he found the patient had an attack of gastritis and enteritis about four years previously, since which she had been troubled with occasional pains in her stomach.*

From an analysis of the foregoing cases, as well as a few others which are upon record, I think we may deduce the following conclusions:

(*a.*) That the peculiar ulceration of the stomach, just described, is very slow in its progress.

(*b.*) That it is frequently unattended by any symptoms indicative of its existence.†

(*c.*) That of the symptoms mentioned by Dr. Baillie, "pain or an uneasy feeling in the stomach," is the only one usually present; and that vomiting seldom occurs.

(*d.*) That with the exception of the ulcerated portion, the stomach is generally found healthy.

(*e.*) That no immediate danger to the life of the patient, attends simple ulcers of the stomach.

(*f.*) That where death does ensue, it is generally the result of peritoneal inflammation, excited by the ulceration having perforated the stomach, and the subsequent effusion of the contents of that organ into the cavity of the abdomen. When this event takes place, no hope is left for the patient. Death seems inevitable. The symptoms attending this state, are very well described by Mr. Travers, and are the following:

1. Sudden, most acute and unremitting pain, radiating from the scrobiculus cordis, or the navel, to the circumference of the trunk, and even to the limbs. "I may add," says he, "a peculiar pain, though I know not how to describe the pe-

* London Medical and Physical Journal, vol. xiii. p. 164.

† The whole account given by Dr. Baillie of the symptoms, is the following "I have reason to believe that ulcers of the stomach are often slow in their progress. They are attended with pain or an uneasy feeling in the stomach, and what is swallowed is frequently rejected by vomiting. Pus and blood are likewise occasionally thrown up by vomiting." (Morbid Anatomy, p. 97.)

culiarity. Its intensity, like that of parturition, absorbs the whole mind of the patient, who, within an hour from the enjoyment of perfect health, expresses his serious and decided conviction, that if the pain be not speedily alleviated, he must die.

2. "Coeval with the attack of pain, remarkable rigidity and hardness of the belly, from a fixed and spastic contraction of the abdominal muscles.

3. "A natural pulse for some hours, until the symptoms are merged in those of acute peritonitis, and its fatal termination in the adhesive stage."*

The *causes* of these ulcers are enveloped in much obscurity. Indeed, in most of the cases, there are none to which they can be referred. In a few instances only have they been traced.

1. External injuries, as blows, &c. upon the region of the stomach. In the case of Mr. Gooch, already recorded, there can be no doubt that this was the cause, although the injury was received twenty years before. As there was no external appearance of inflammation in this instance, it is probable that the stomach was primarily affected by the injury received; but it is impossible to determine whether the peritoneal or mucous coat was first affected. At any rate, however, it makes us acquainted with a possible consequence of slight external injuries about the region of the stomach, of so serious a character, that every possible precaution should be adopted to obviate their effects.†

2. Previous disease of the stomach. In the case of Dr. Male, already related, an attack of gastritis, four years before, seems to have been the only assignable cause.

3. The accidental introduction of some poisonous substance into the stomach. I am not positive that this has actually been

* Medico-Chirurgical Transactions, vol. viii. p. 244-5.

† By Dr. Ebermaier, a case is related of a man fifty years of age, who had complained every two or three months for the last five years of his life, of pains in the abdomen. He died suddenly. On dissection, a hole, the size of a two franc piece, with callous edges, was found in the right anterior surface of the stomach. Five years before the commencement of the symptoms under which he labored, he had received a blow from the pommel of a saddle on the epigastric region. (American Journal of Medical Sciences, vol. 3, p. 454.)

a cause of ulceration in the stomach, although it is more than probable. Dr. Pascalis records a case of perforation of the stomach, with which it appeared that the patient had lived five or six years. On dissection there was discovered a large aperture, of the size of a dollar; and in the cavity of the stomach a large tumour, formed by several branches or roots, proceeding from the internal edge of the aperture in the fundus, and lined with a strong membrane, resembling the villous coat of the stomach. Dr. P. informs us that the patient was a painter and glazier by trade, and must have been exposed to the accidental introduction of arsenical or other deleterious matters into the stomach.*

4. Improper and stimulating food, as well as the too frequent use of certain medicines, may doubtless in some instances have caused it, although I have not met with any particular case in which it could be traced to this source.

Cases like the preceding are interesting and important, not only in a pathological point of view, but in their relations to medical jurisprudence. Appearances like those which have been described, may be confounded with the effects of poisons, and their diagnosis may become therefore a problem of the highest moment—involving character and even life. On this point, however, it is not my intention, at present, to enlarge. It has been discussed by writers of acknowledged authority, and to these I must refer the reader.†

* Medical Repository, vol. xviii. p. 287.

† Considerations Médico-Légales sur les erosions et perforations spontanées de l'estomac. Par G. Laisne. Paris, 1819. A Treatise of Poisons, by Robert Christison, M.D. &c. p. 106. Elements of Medical Jurisprudence, by T. R. Beck, M.D. and J. B. Beck, M.D., in the chapter on Poisons, by T. R. Beck, M.D. vol. 2, p. 273, 5th edition.

INDEX.

ERRATA.

Page 26, line 20, for *encourage* read *discourage.*
68, 15, for *cen* read *centre.*
75, 25, for *it* read *life.*
136, 27, insert *almost* before *invariably.*
151, 7 from bottom, for *variosus* read *venosus.*
228, 11, for *exaplanation* read *explanation.*